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# TURKEY RAISING IN CALIFORNIA

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# TURKEY RAISING IN CALIFORNIA

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## INTRODUCTION

Turkey production in the United States first started along the Atlantic Seaboard and has gradually come westward. In the East as turkey production increased, disease problems multiplied until there was a definite decrease in turkey growing. In recent years eastern growers have demonstrated that by strict sanitation they can successfully grow turkeys. Clean ground, houses, feed, and stock rather than medicines are the methods used to combat disease. Prevention was found to be the only satisfactory way to control disease.

During the time turkey production was on the wane in the East it grew in the western section of the United States. Less turkey and poultry population in this section and particularly the drier climate tended to prevent diseases and parasites. In recent years, however, some sections that have become densely populated with turkeys and poultry have been having severe losses through diseases, parasites, or both. It is apparent that the western turkey grower also must pay strict attention to sanitation. By modern artificial rearing methods and sanitation, diseases and parasites are much more easily controlled than when natural methods of rearing are practiced.

California is rapidly becoming an important turkey-producing state, for the long, dry summers seem to favor turkey production on a large scale. Until the last two or three years, however, very little artificial hatching and rearing was done, though both have been successfully carried on at the California Experiment Station for the past fifteen years and repeated efforts were made to interest the growers in artificial methods. Turkey growers have ever been fearful of things mechanical and even after artificial hatching had again and again been demonstrated they were reluctant to believe that artificial brooding could be successfully accomplished in the field.

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Gradually a few growers here and there tried out the new methods in a tentative sort of way and after convincing themselves that the principles were sound spread the 'news' until many sections now employ artificial means altogether in the rearing of the young birds. The employing of the more modern and advanced methods of rearing was greatly hastened by the advent of the day-old poult, which made its appearance some four years ago. This branch of the turkey industry has made very rapid growth until in the 1930 season several hatcheries in California produced over 60,000 poults each. This system of producing poults without mother hens necessitated resorting

Fig. 1.—Commercial turkey flock in a desert area. The corn in the background is grown for shade.

to some other means of brooding, hence the sudden acceptance of artificial rearing methods; but the great majority of the turkeys in California are still reared by the natural turkey mothers. Successful artificial rearing methods which have been developed during fifteen years' experience will be outlined in this circular.

*Localities Adapted to Turkey Production.*—Turkeys are upland birds and thrive in a mild, dry climate. Areas exposed to strong cold winds, excessive fogs, and low, damp, or marshy areas are not suitable for successful turkey production.

*Effect of Section of the State on Methods of Production.*—The methods of turkey production differ in various parts of California. The flocks are much smaller in southern California than in northern California. The birds in the south are incubated and brooded mostly under artificial conditions, whereas in the north many of the birds

are still hatched and raised with the hens. The laying season is much longer in the south, resulting in more eggs per hen and in more birds raised per hen. The use of artificial methods also increases the investment per hen in the south as compared with natural methods in the north. There is some difference in the feeding methods, in that alfalfa range is largely used in the south, whereas in the north the birds are fed on dry ranges. The use of better feeding practices in the south increases the average dressed weight of the turkeys sold. It is also probable that the turkey growers in the south are more particular in selection of breeding stock, and thereby raise larger market turkeys. The feed cost, however, is considerably less in the north. On the other hand, although costs per pound of meat are more in the south, the income is also higher, making the profits in the two districts comparable. An example of typical differences between the districts may be seen by comparing the figures for Tehama County with those for San Bernardio County in tables 2 and 3, pages 50 and 51.

## MAKING A START

There are three usual ways of starting in the turkey business: (1) by the purchase of breeding stock; (2) by the purchase of hatching eggs; and (3) by the purchase of day-old poults. No matter which method is selected, the permanent success of the enterprise will depend upon the quality of the foundation stock. This is the most neglected of all phases of the business as it exists today in this state. Continued success cannot be had if the quality of the stock is not carefully considered and continually improved, yet many turkey reproducers today pay practically no attention to this most important item. This does not necessarily mean that the grower must have purebred stock, though usually better results will be obtained from well-bred stock. Nor does it mean that high-priced show stock is essential, but it does mean that stock used for breeding purposes must be strong, vigorous, quick-developing, nearly up to the standard weight requirements for the breed and free from diseases.

The breed to be selected by the prospective turkey raiser is the one that best meets the market demands and the individual preference. It is usually desirable to grow the breed that is most popular in the community, because the difficulties of securing breeding stock, and of marketing that particular breed, have already been pioneered.

## VARIETIES

There are six varieties of turkeys listed in the American Standard of Perfection. They are all of the same breed. Varieties are differentiated by the factors of color and feather markings, while differentiating between breeds is by body shape or type, and all standard varieties of turkeys are of the same shape or type. The standard weights of the Bronze are slightly higher than those of the other varieties as shown by the following table:

1930 STANDARD

| | Pullet | Hen | Cockerel | 1-year cock | Adult cock |
|---|---|---|---|---|---|
| | *lbs.* | *lbs.* | *lbs.* | *lbs.* | *lbs.* |
| Bronze | 16 | 20 | 25 | 33 | 36 |
| Bourbon Red | 14 | 18 | 23 | 30 | 33 |
| Narragansett | 14 | 18 | 23 | 30 | 33 |
| White Holland | 14 | 18 | 23 | 30 | 33 |
| Black | 14 | 18 | 23 | 30 | 33 |
| Slate | 14 | 18 | 23 | 30 | 33 |

Weights as given in the Standard are somewhat misleading, however, since the weights are not actual but only a guide or an ideal and may be but infrequently attained. For instance, Bronze hens and Black cocks only occasionally reach the weights assigned to them, while Bourbon Red, Narragansett, and White Holland cocks frequently equal and sometimes outweigh any but the very largest of the so-called 'Mammoth Bronze.'

## CARE AND MANAGEMENT OF THE BREEDING FLOCK

### SELECTING STOCK

The beginner should start with purebred stock if it is obtainable at a reasonable price. The original cost of purebreds is little more than scrub stock, while personal satisfaction and money returns usually are far greater. If already in the turkey business only purebred toms should be used. In a few years the flock will be "bred up" until for practical purposes they are equal to purebreds.

The turkey raiser who has quick-maturing stock has a definite advantage over the individual who has slow-maturing stock. It takes less labor and less feed to put rapid-maturing birds on the market. Many turkey raisers in California are putting birds on the market fully matured in seven to eight months after hatching.

Breeding birds should be selected in October, or at least before any birds are sent to market, thus insuring that the earliest-maturing and best birds are kept for the breeding flock.

In choosing stock for breeding purposes there are a few general rules that apply regardless of what variety is under consideration:

1. Select early-developing birds of alert bearing and proud, upright carriage.
2. Discard all birds with short or crooked breast bones, the longer the bone the better; and first-class birds should have breast bones that measure 7 to 7½ inches in length. Remember that the longer and straighter the breast the more meat there will be for slicing.
3. Do not purchase or retain for breeders slow-maturing birds; it is better to discard all such and purchase others if no better are available at home.

Fig. 2.—Select breeders before any birds are sent to market.

4. The head should be of good size, broad with comparatively short beak. In males this is very important.
5. Males should have well-developed beards as this is an indication of masculinity.
6. Shanks in both sexes should be strong and sturdy in order to be able to support the weight of heavy birds. They should not be so long as to give the bird a stilty appearance. Birds with long shanks are slow to fill out, that is, slow to cover the bony structure with flesh. The earlier-maturing type is set rather close to the ground, though not so much so as to present the appearance of a duck.
7. Both males and females should have long, broad, deep frames with broad backs.
8. The better old hens should be kept, for almost universally yearling or older hens make better breeders than pullets. Old hens lay larger eggs than pullets and since there is

a direct correlation between the size of the egg and the size of the poult, larger poults will be hatched from the larger eggs. Hens may start to lay a little later in the season than pullets but the difference in starting dates is usually of very little consequence. The best method is to replace one-third of the hen flock each year with pullets. This would mean a complete replacement only every three years. Egg production may go down very rapidly after the third year. Turkeys do not reach full maturity until two years of age. In the larger breeds, pullets should weigh 12 to 14 pounds, in the smaller breeds slightly less. The practice of selling the early-maturing birds for market and keeping the slower-maturing, or weaker birds for breeders should be strongly condemned.

9. Very large toms should be discarded as they are liable to be awkward, may tear the hens and are apt to be poor breeders. Usually toms weighing between 22 and 28 pounds will be the most satisfactory.
10. Great care should be exercised in selecting breeding stock to see that it is free from disease.
11. Parasites, both internal and external should be eliminated before any birds are put into the breeding pens.

## MATING

Breeding birds should not be too fat when mated, because toms that are too fat are apt to be sluggish, and hens with fat on their backs are easily torn by the tom. Such tears, while they only occasionally prove fatal, usually retard laying two or three weeks while the hen is recovering and she may not be a profitable producer for the remainder of the breeding season.

Young toms should be mated to old hens and old toms to young hens if it is at all possible to do so, but if a flock of hens of mixed ages is kept, then it would be better to keep young toms since they are usually more active and vigorous and of less weight.

Allow one tom to each ten hens, for while a good, active vigorous tom can usually take care of fifteen or more hens, yet the percentage of sterility in turkey males is rather high and it is best not to take the chance of one or more sterile males in a flock that is not overstocked with males.

A good practice is to release only a portion of the males intended for the flock at any given time so as to prevent fighting and inter-

ference with breeding. One-third might be released one day, another third the next, and the remainder the next, if quarters are arranged so as to be able to do so. The reserve pen of toms or any other toms should be out of sight of the flock of hens. When other toms can be seen some hens will refuse to mate with the toms in the pen. These hens will 'walk the fence,' that is, walk up and down along the fence, trying to get to the other toms. Sacking or brush tacked to the fence, or any other material that will act as a screen is satisfactory. The rotation of toms is a chore, however, that most turkey keepers dislike, and it is only occasionally practiced regularly and systematically; however, good practice should not be neglected merely because it entails more work.

For best results with matings in a large flock the birds should have plenty of room. A pen with large weeds in it or an orchard is very satisfactory, for the weeds or trees act as a screen and allow the toms to serve the hen without interruption.

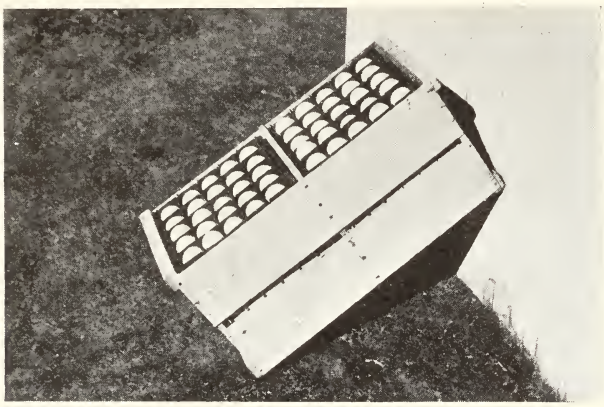
The second egg after mating should be fertile, but in flocks it is best to wait five to seven days after the tom is introduced to the flock before saving eggs. Many turkey raisers believe that if the hens have started to lay before the tom is brought into the flock no fertile eggs will be obtained. This is not necessarily true. However, turkey hens have a definite period of breeding prior to or immediately after starting to lay each clutch of eggs. (A clutch is the number of eggs laid before the fowl pauses and goes broody). After this breeding period is past the hens may refuse to accept service. If, therefore, the breeding period for any particular hen is past when the tom is introduced to the flock, she may and probably will refuse to have anything to do with the tom and all her eggs for that clutch will be sterile. One fertilization for each clutch is all that is necessary.

## PRODUCTION AND CARE OF EGGS

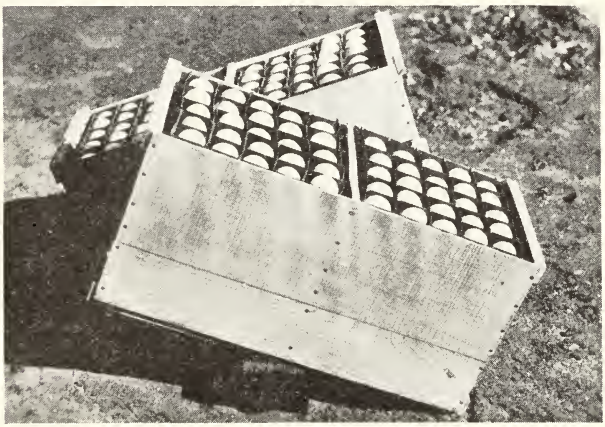
In California the time that turkey hens start to lay is dependent largely on the section of the state, temperatures, and the age of birds. Generally speaking, laying starts first in the coastal region from San Diego north, followed by the Sacramento and San Joaquin valleys, and lastly in the higher mountain sections.

Eggs may be laid in groups of 12 to 30 eggs, after which the bird normally wants to sit. However, since some selection on the basis of egg production has been done by turkey breeders and the heavy layers have been kept as breeding stock, the tendency to lay eggs in groups, and then to rest is becoming somewhat less marked. The

average number of eggs laid per bird in California during the normal laying season is between 35 and 45 eggs provided the hen is not allowed to sit. Where the hen is set, the production of eggs runs from 18 to 25 eggs per hen per season and there may be but the one clutch.



*A*



*B*

Fig. 3.—Ordinary chicken-egg cases with duck-egg fillers make turning of eggs awaiting incubation easy.

*A*, Case tilted against a wall. To turn, position of case is reversed. This involves lifting the heavy case.

*B*, Case is elevated on a 4 x4 inch block near center of case and eggs are turned by tilting in opposite direction without unnecessary lifting.

One bird at the California station laid 170 eggs in one year. This, however, is a very rare exception.

Eggs for hatching should be gathered twice a day and placed in a cool place, the optimum temperature being between 40° and 60° Fahrenheit. They should be turned at least once a day while being

held for hatching. Many growers put turkey eggs in chicken-egg cases, with duck-egg fillers. The case is propped against the wall with the end about 16 inches from the floor. The next day the other end is propped against the wall (fig. 3). Eggs should not be held longer than 14 days, though eggs much older do hatch. The viability of the germ is reduced by age and the percentage hatch is apt to be very much smaller with eggs held for a long time. Eggs to be used for hatching should never be washed, no matter how dirty, as the rubbing and water will remove a protective coating from the shell. Coarse dirt may be removed by light scraping.

Turkey eggs for hatching should have a minimum weight of 2¾ ounces, a maximum weight of 3½ ounces, and an average weight of 3 ounces. The selection should be very rigid. Eggs larger than 3½ ounces are very liable to contain two yolks ('double' yolks) and such eggs seldom hatch. Eggs smaller than 2¾ ounces hatch undersized, weak poults when they hatch at all. For five years the eggs that hatched best at the California station averaged about 3 ounces. Small eggs did not hatch well.

Turkey hatching eggs should have smooth, uniform, hard-textured shells containing no thin or 'sanded' spots. No eggs of irregular shape should be set. Good hatching eggs may or may not be well sprinkled with freckles and may have a few excrescences of calcium or shell-building material. The idea that perfectly white turkey eggs will not hatch is erroneous and is probably engendered by the belief that all white turkey eggs have chalky shells. Chalky-shelled eggs are rough to the touch and have large pores. Eggs with chalky shells seldom hatch.

## EGG PRODUCTION AS AN INDUSTRY

In California the production of turkey eggs as an industry is becoming a very important factor in turkey production. The hens usually lay earlier in California than they do in the adjoining mountain states and there is a ready demand for these earlier eggs.

In southern California egg production starts in the early winter and gradually increases until a peak of production is reached some time during March. Because these eggs are laid early in the season they are not only in demand locally but also in the central and northern sections of the state and in nearby states, where the hens do not come into production until later in the season. Normally production does not start in northern California in any volume until the first of March. From March 15 to May 1, there is a big demand for

turkey eggs. Usually the maximum production of a flock in northern California is secured between March 15 and April 15. After April 15, when hens begin to sit, production drops. A few eggs are for sale at very low prices from May 1 to as late as June 1. Unfortunately most commercial turkey eggs usually are produced by pullets. The pullets and toms are generally sold after the flush of egg production is over. Too little attention has been paid in the past to selection of stock for egg production. Buyers of eggs or poults should welcome and encourage efforts to improve the quality of commercial breeding stock.

## FEEDING BREEDING STOCK[4]

The breeding stock should have a good, coarsely ground laying mash, before them at all times and should be fed whole grain once a day, preferably in the evening.

Fig. 4.—Open wire-enclosed roosting pens with magazine mash feeder and trough for grain. Trees provide shade in hot weather.

A good laying mash is as follows:

80 lbs. ground grains or mill feeds
(wheat, barley, corn, milo, kafir, oats, bran, etc.)
15 lbs. fish or meat scrap, or both.
2 lbs. ground limestone.
2 lbs. ground bonemeal.
1 lb. salt.

100 lbs.

Some breeders prefer to have dried milk in the laying ration; 2 or 3 pounds of dried skim milk may be added to the above ration without seriously affecting its balance.

[4] See also "Feeding", pages 28–39.

Freshly cut greens should be provided daily. A satisfactory hopper for green feed is shown in figure 15 (page 33). A substitute is 7 per cent alfalfa meal or finely chopped high-quality alfalfa hay added to the mash. Alfalfa hay as a supplement should also be put in the pens for the birds to pick at. Wherever possible it is highly desirable to have green barley or alfalfa pasture for the breeding flock to range over. This is in addition to fresh-cut greens or the substitute and supplement suggested above. Shade and fresh water should be available at all times for the breeding flock.

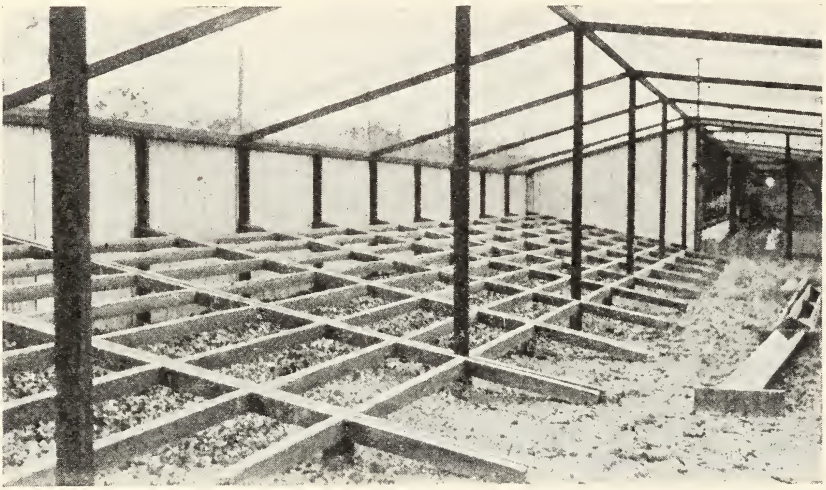


Fig. 5.—Enclosed open-top roosting quarters. At far end are enclosed, roofed, open-front roosting quarters. Roosts are here placed with the wrong surface of the 2 x 4 inch boards up.

## HOUSING BREEDING STOCK

Some people house their breeding stock in sheds enclosed on three sides, while others let the birds roost out in the open. Where there is heavy rainfall or exceptionally cold weather, shelter should be provided. Shelters are optional where the rainfall is light and the temperatures moderate. When a shelter is provided it is desirable in most localities to have it enclosed on three sides. The shelter should be free from drafts but in no case should it be so enclosed as to prevent proper ventilation.

The pen should be large enough to keep the birds contented. They should be put in the pen before they have selected nesting places outside.

A good catching chute such as that illustrated in figure 23 is very desirable in any system of handling large numbers of breeding birds.

It is made with wire overhead so the turkeys cannot fly out. The turkeys are caught from the side of the catching chute by grasping the legs with one hand and putting the other hand underneath the breast and then drawing the bird from the chute. This chute is used when birds are to be treated for various diseases, segregated, killed for market, or selected as breeders.

## INCUBATION

### NATURAL INCUBATION

Although the disease problem in turkeys has made the artificial method of incubation popular, natural incubation will still be followed by many people who do not have the equipment for artificial methods. In commercial practice it is common to save the turkey eggs until after ten or even more hens are broody and then to set them

Fig. 6.—'A' coops—very satisfactory for natural methods of brooding.

all at once. Many turkey raisers set eggs in an incubator or under chicken hens, and later give these eggs to turkey hens that have become broody. In this way it is possible to get earlier hatches and the eggs are not saved for as long a time. Occasionally the turkeys are hatched under the chicken hen or in the incubator and are given to the turkey hen after they hatch. Ordinarily a turkey hen can cover 15 to 18 eggs, but a chicken hen should not be given more than 8 to 11 eggs. Although a turkey hen may hatch between 15 and 18 turkeys, it is possible for her to brood up to 20 poults.

Nests can be easily made out of small barrels, with one end knocked out, laid on their side with a little straw in the bottom. The barrel should be blocked to prevent rolling and a 6-inch board nailed across the bottom of entrance to prevent eggs from being kicked out. Turkey hens seem to prefer this type of nest to most others. A-shaped coops also make a satisfactory nest and have the advantage of longer life than barrels.

The 'A' coops illustrated in figure 6 are the usual equipment used in setting turkey hens. A depression is scraped out in the ground for a nest and straw placed there. In dry weather it is advisable to dump a good-sized bucket of water into this hole several days before the nest is made and the hen set. This is particularly valuable late in the season when the weather is dry and the hatching eggs may not get sufficient moisture.

The hens should be thoroughly dusted with sodium fluoride at setting time. The hen should be put on the nest for 2 or 3 days with a few nest eggs, before she is given eggs to be hatched. This is to allow her to get settled.

The usual time for the first setting hens in northern California is March 1 to 15, although some are set earlier. The last setting is usually made not later than May 1. It is advisable to move all broody hens after dark. Care should be taken to see that hens sitting on eggs leave the nest at least once a day. Provide grit, mash, and cracked grain, and be sure green feed is available at all times. Water may be furnished in a drinking fountain or may be placed in an open can under the edge of the coop. Provide clean, fresh water every day.

## INCUBATORS

Any incubator, hot air, hot water, or electric, of proved worth for the hatching of chicken eggs should be satisfactory for the hatching of turkey eggs. The difficulties encountered by many in the hatching of these eggs should not be attributed entirely to the incubator but rather to the inexperience of the operator. Turkey eggs are larger, have harder shells and tougher membranes than chicken eggs. They are usually hatched at a later season, which under general California conditions means less atmospheric humidity. Chicken eggs require about 21 days to hatch; turkey eggs require 26 to 30 days with an average of about 28 days. All these differences require that a change in technique be employed if success in hatching is to be attained.

For hatching turkey eggs an incubator has about four-fifths the capacity it has for chicken eggs; it may have a smaller capacity if it is equipped with corrugated trays or with a turning device that occupies an unnecessarily large amount of space.

## OPERATION OF THE INCUBATOR

Turkeys are no harder to hatch artificially than are chickens. They require somewhat different treatment, it is true, and there are certain deviations from the standard treatment of chicken eggs, but the percentage of hatch is likely to be just as good as and even better than is generally considered satisfactory with chicken eggs.

*Temperature Regulation.*—The same heat requirements hold good for turkeys as with chickens. The temperature at which machines should be run is 102° Fahrenheit with the bulb of the thermometer placed just above where two eggs come in contact with each other and nestling down between them. The bulb should preferably touch two eggs, though this is not necessary. No variation is made from this temperature except that the temperature may be allowed to increase to 103° or 104° F during the time that the poults are hatching.

Before the hatching season starts the incubator thermometer should be checked with a thermometer known to be accurate. A clinical thermometer is excellent if available. Immerse the bulbs of both thermometers at the same time and to the same depth in water which is at a temperature of approximately 100° F and then compare the readings. If the thermometer to be used reads one degree lower than the standard thermometer then it will be necessary to run the incubator at 101° by the incubator thermometer in order to have the correct temperature of 102°; but if the incubator thermometer reads 1 degree higher than the test thermometer then the incubator should be run at 103° in order to get the correct temperature of 102°.

The operation of different types of incubators will vary somewhat, but in general the method of procedure is as follows:

Eggs are set in just the same way as for the hatching of chicken eggs and are turned and cooled twice daily after the second day in the machine. During the first 2 days the machine is not opened unless such action is necessary for the adjustment of the thermometer, etc. Eggs are cooled until the small end of the egg placed against the closed eyelid of the operator registers neither hot nor cold. Cooling will take from but a few minutes in the beginning up to 40 or 45 minutes toward the end of the hatch. If forced draft machines are used, eggs need not be cooled. The flow of air through the machine is not restricted as with hen eggs. The ventilators are opened up to allow for a plentiful flow of fresh warm air through the egg chamber. This may be slightly restricted just at hatching time in order to raise the humidity in

the machine if difficulty in maintaining sufficient moisture is experienced, otherwise no reduction in flow of air should be made. The temperature at hatching time may also be allowed to increase slightly.

*Moisture Supply.*—A plentiful supply of moisture must be maintained, but the amount will have to be gauged by the amount of evaporation in the egg as indicated by the size of the air cell when the egg is held before the bright light of an egg tester.

More moisture is required for the hatching of turkey eggs than for chicken eggs but even poults can be 'drowned' in the shell by maintaing an injudiciously high humidity.

Frequent tests should be made before a strong light to determine the amount of evaporation.

If air cells enlarge too rapidly (see fig. 7) the moisture in the machine should be supplemented by sprinkling the eggs two or three times per week with tepid water. In machines known to be moisture-deficient, grain sacks dipped in hot water and lightly wrung out should be placed in the bottom of the machine when the machine is closed up at the end of the twenty-fourth day. The sacks will give off additional moisture and will be dry by the time they are needed by the poults as nursery trays.

## TESTING EGGS FOR FERTILITY

Eggs should be tested on the tenth day for fertility and all clear eggs or infertiles removed, also all that have died prior to that time. If the egg has not been fertilized it will present a clear appearance with one large spot near the center, slightly darker in appearance than the rest; this is the yolk, which shows but dimly and is round in appearance. If the germ has started to develop but later died the yolk will have settled below the center into an elongated, dark, and rather flat mass (fig. 7).

If the germ is living the candle will reveal a dark spot near to and a little above the center from which irregular red lines radiate out much like the legs of a spider. At the twentieth day the eggs should again be tested and any further dead germs removed. The dead germ eggs if left in the machine constitute a menace to the live embryos by reason of foul gases given off, and they also occupy space that may be needed.

The eggs are turned and cooled for the last time at the end of the twenty-fourth day, extra moisture (if needed) is placed in the machine, and the incubator closed until after the hatch. Eggs start

to pip about the twenty-sixth day. The hatch should be over by the end of the twenty-eighth day but may be either earlier or later. If after a piece has been broken out of the shell, the poult fails to come out of the shell within a few hours and the shell membrane turns chalky white, a shortage of moisture is indicated. A mucilaginous

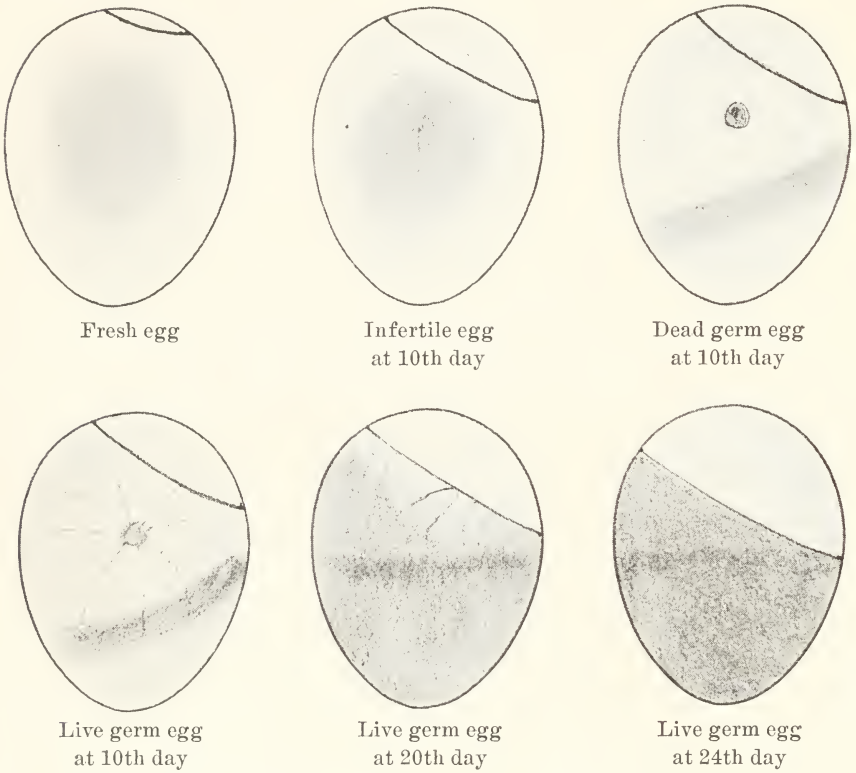



Fig. 7.—Increasing size of air cell in live-germ egg as development takes place.

substance exuding from the aperture indicates an oversupply of moisture. Nothing can be done in the latter case, but steps may be taken to correct the condition in subsequent hatches.

Poults should not be allowed to drop into a deep nursery tray while wet but should be allowed to fluff out before plunging into the much cooler temperature of the nursery tray. The slide should therefore be left in the tray until most of the poults have hatched.

Helping out of the shell should only be practiced in rare instances, because most poults that cannot get out of the shell unaided will be of little or no value and are extremely liable to be crippled.

A crippled condition can be brought about by improper handling of eggs being held for incubation and by unsuitable hatching conditions.

Poults should be allowed to remain in the incubator 24 hours after hatching to permit them to fluff out and become hardened to the slightly cooler atmosphere of the brooder.

## BROODING

### BROODERS

The brooder stove should be cleaned, set up, and operated for at least 2 days before any poults are put under it.

Almost any kind of brooder from the standpoint of fuel used—coal, oil, gas, electric, or even the fuelless brooder known as the 'fireless' if properly handled will do for poults. This is equally true

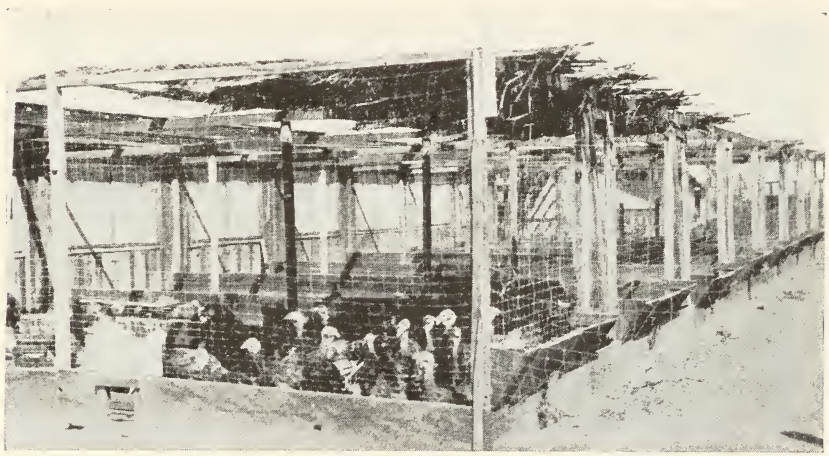


Fig. 8.—A permanent brooder house. Green-feed hoppers are placed on the end of runs. Pens partially shaded make it comfortable on hot days.

of the method of application of the heat—it may be by hot water, by hot air, or by radiation from electric coils—but the point of adhering to small units is essential; almost all attempts at growing large numbers together have proved disastrous. Poults are more prone to crowd together and smother when brooded in large units than are chicks and many troubles will be avoided if the operator will confine his brooding operations to small-sized units. The poult is a very different creature from the chick; he is heavier and his center of gravity is higher; he is easily thrown off balance and falls more heavily and cannot stand the same rough handling that chicks do and survive.

The space allowance for poults in both the hover and the house is about twice that for chicks, which means that 14 square inches under the hover and 1 square foot in the house is about right. Thus a circular hover 42 inches in diameter has a capacity of 200 chicks but only 100 poults. Housing allowance might be slightly reduced if the possibility of late rains or cold and windy weather were eliminated, but the probability that the poults will have to be confined to the houses at times owing to the inclemency of the weather necessitates that they be provided with plenty of room.

## BROODER HOUSES

Houses that are suitable for the brooding of chicks will be found satisfactory for poults, the requirements being practically the same. Those who have large brooder houses that were built for chicks can

Fig. 9.—*A*, Colony brooder house with top doors opened to admit maximum of sunlight; run with top panels removed.

*B*, One door only open to admit attendant or for entrance of sunlight; run covered.

*C*, Doors closed to conserve heat and to protect from weather.

use these same houses for poults provided the houses have been thoroughly cleaned and disinfected. Small colony houses will be found very satisfactory also, and they have the added advantages of being cheaper to construct and more easily moved from place to place to prevent spread of disease by continued use and consequent contamination of one location.

The colony house shown in figure 9 has the advantage of cheapness and convenience of handling. Brooder houses for poults should provide

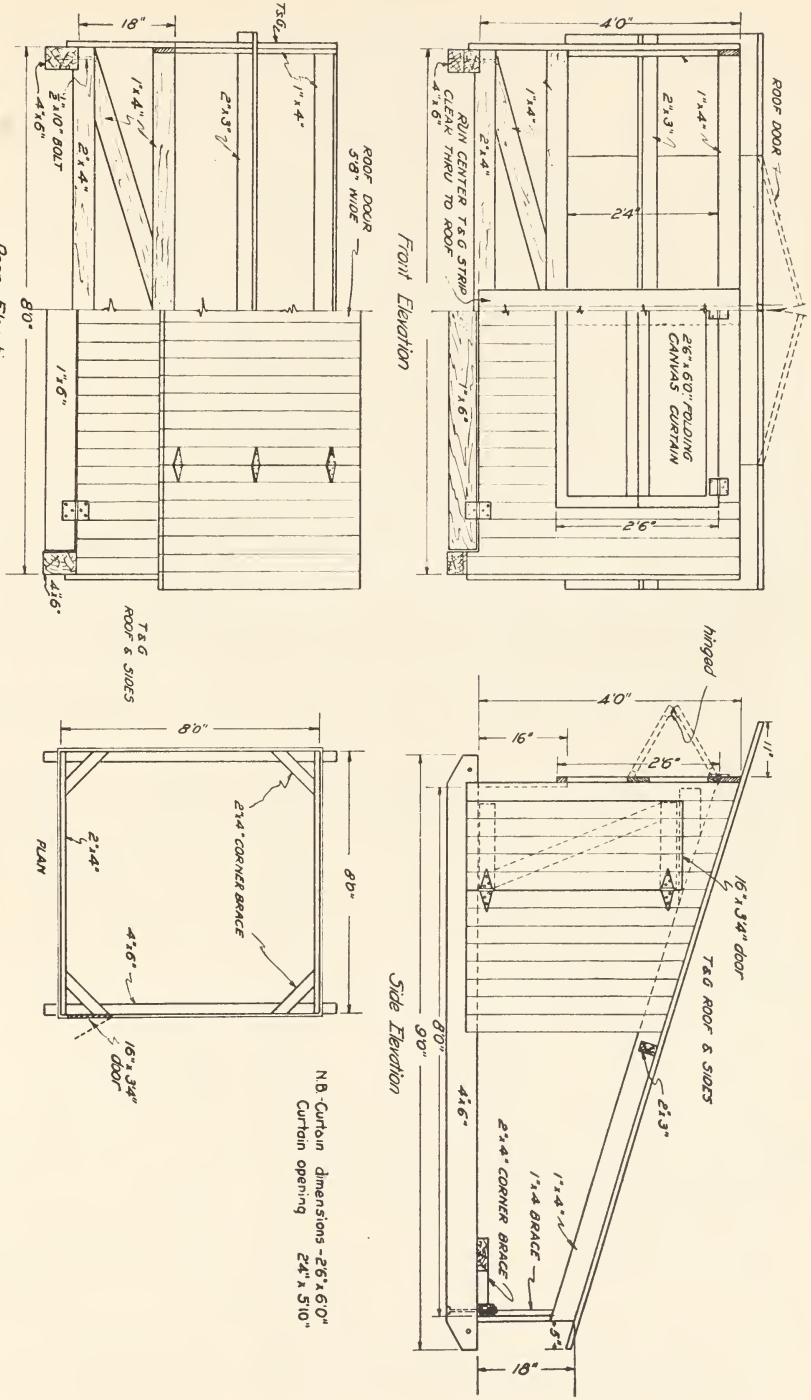



Fig. 10.—Plans of movable turkey colony brooder house. (Designed by W. E. Lloyd.)

for the poult outlet close to the ground as poults with their different temperament will not go up and down the long sloping runways that are sometimes provided for chicks. This fact coupled with the necessity for providing as economical housing as possible is the reason for designing a colony brooder house without a floor. The top doors permit entrance of the attendant by stepping in over the low rear wall but a door in the side will be found a convenience in stormy weather or at night especially in cold weather when it is desirable that as little heat as possible be lost. Such a colony house provides all the shelter necessary under California conditions especially during the time of year when turkeys are being brooded. This building combines strength, convenience, and economy in the successful brooding of poults. A 6-inch hinged board extending the entire width of the front provides the poult outlet and a corresponding board at the rear is hooked up during moving operations to prevent damage to the house from irregularities in the ground. Hinged muslin curtains on the open front shut out storms and drafts and permit opening during good weather for the admission of sunlight and fresh air. The top doors may also be opened for this purpose. Plans for the house are given in figure 10. The list of specifications is as follows:

Specification List for Colony Brooder House with 18-Inch Rear Wall

| | | | |
|---|---|---|---|
| *Front wall* | | | |
| 22 pcs. 1″x4″—1′8″ | T & G flooring | O.P. | Siding |
| 8 pcs. 1″x4″—4′ | T & G flooring | O.P. | Siding |
| 2 pcs. 1″x4″—8′ | S2S | O.P. | Runners (middle and top) |
| 1 pc. 2″x4″—8′ | S2S | O.P. | Runner (bottom) |
| 1 pc. 1″x6″—7′4″ | S2S | O.P. | Poult outlet door |
| 2 pcs. 1″x4″—4′4″ | S2S | O.P. | Braces |
| *Rear wall* | | | |
| 30 pcs. 1″x4″—1′8″ | T & G flooring | O.P. | Siding |
| 1 pc. 1″x4″—8′ | S2S | O.P. | Runner (top) |
| 2 pcs. 1″x4″—4′4″ | S2S | O.P. | Braces |
| 1 pc. 2″x4″—8′ | S2S | O.P. | Runner (bottom) |
| 1 pc. 1″x6″—7′4″ | S2S | O.P. | Poult outlet door |
| *End walls* | | | |
| 60 pcs. 1″x4″—1′9″ to 4′2″ | T & G flooring | O.P. | Siding |
| 2 pcs. 1″x6″— 8′ | S2S | O.P. | Runners (top) |
| 2 pcs. 4″x6″—10′ | Com. | Rdw. | Sills (also skids) |
| 4 pcs. 2″x4″—2′ | S2S | O.P. | Corner frame braces |
| *Roof* | | | |
| 31 pcs. 1″x4″—10′ | T & G flooring | O.P. | Roof boards |
| 1 pc. 2″x4″—8′6″ | S2S | O.P. | Center beam |
| 6 pcs. 1″x4″—2′6″ | S2S | O.P. | Cleats for doors |

*Curtains*

| | | |
|---|---|---|
| 4 pcs. 1″x2″—6′ | Low grade white pine | Side rails |
| 6 pcs. 1″x2″—1′ | | End and center rails |
| 2 yds. 24″ wide muslin | | |

*Hardware list*

| | |
|---|---|
| 3 prs. 4″ light strap hinges | Top doors |
| 6 prs. 3″ light strap hinges | Poult outlets and curtains |
| 4 ⅜″x5″ common lag screws | Side rails to skids |
| 2 2½″ screw hooks and eyes | Poult outlet doors |
| 6 ft. of 24″ wide 1″ mesh poultry netting | |
| 2 lbs. 6d cement nails | |
| 2 lbs. 6d common nails | |
| 2 screw hooks, square turn No. 905 | |

N.B.—No provision made in this list for door in side.

The floor of the brooder house may be covered with fine gravel or coarse sand; this provides first grit used by the poults, furnishes an insulation from the possible cold or dampness of the floor and is a protection against fire in case anything goes wrong with oil or coal burning stoves. The sand may be gone over at frequent intervals with a fine-toothed rake for the removal of feces and additional sand may be added as needed. No litter is needed for poults as they scratch but little.

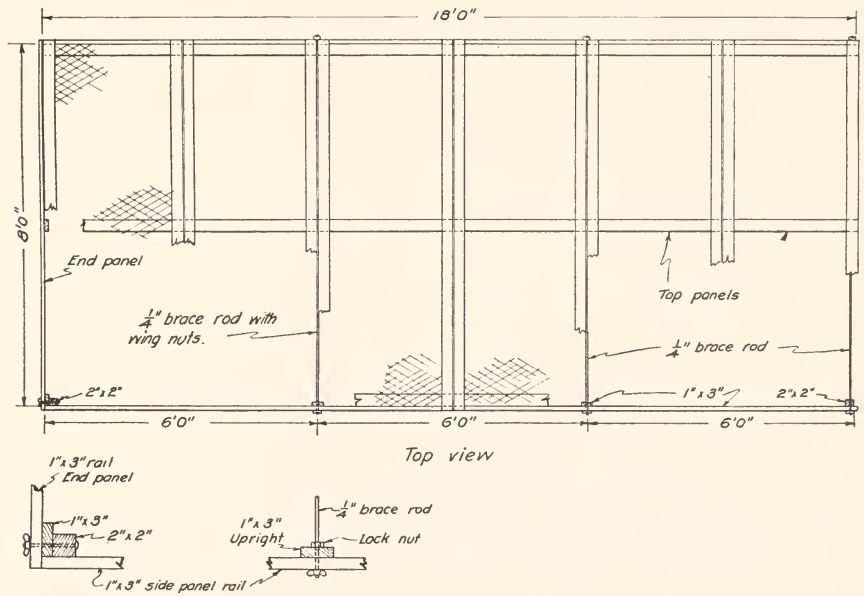



Fig. 11.—Top view of brooder run showing method of joining corners and of bracing run with iron rods for rigidity. (Designed by W. E. Lloyd.)

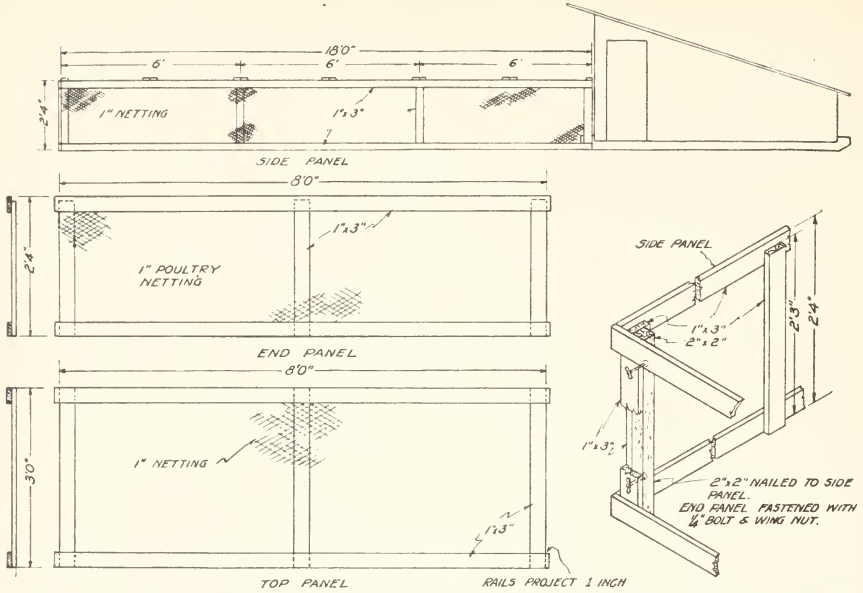



Fig. 12.—Top, end, and side panels and method of joining brooder run. When used in connection with brooder house, one end may be omitted. (Designed by W. E. Lloyd.)

For a house of this kind it is desirable to have a run that is convenient, strong, easily moved and so constructed that the birds cannot escape. A knock-down run combining these features is illustrated in figure 9 and plans are given in figures 11 and 12. A list of specifications and materials is given below:

SPECIFICATION LIST FOR KNOCK-DOWN POULT REARING PEN WITHOUT FEEDING PANEL

(For use with colony brooder house)

*Two side, two end, and six top panels*

| | | |
|---|---|---|
| 4 pcs. 1″x3″—18′ | Common | Top and bottom side rails |
| 4 pcs. 1″x3″—8′ | Common | Top and bottom end rails |
| 12 pcs. 1″x3″—8′ | Common | Side rails for top panels |
| 18 pcs. 1″x3″—3′ | Common | End and center cross pieces for top panels |
| 10 pcs. 1″x3″—27″ | Common | End and center uprights for end panels and center uprights for side panels |
| 4 pcs. 2″x2″—27″ | Common | End uprights for side panels |
| 2 pcs. 1″ mesh poultry netting 24″x18′ | | Preferably galvanized after weaving |
| 2 pcs. 1″ mesh poultry netting 24″x 8′ | | |
| 6 pcs. 1″ mesh poultry netting 36″x 8′ | | |

8 ¼″x3½″ machine bolts (square heads) with washers and wing nuts (for corners)

2 rods ¼″x8′1½″ threaded at both ends a distance of 3″, with 2 washers, 1 common nut and 1 wing nut for each thread (for braces)

2 lbs. 8d cement box nails

2 lbs. ¾″ wire staples

*Material List*

| *Lumber* | *Hardware* |
|---|---|
| 4 pcs. 1″x3″—18′ | 52′—1″ mesh poultry netting 24″ wide |
| 12 pcs. 1″x3″—16′ | 48′—1″ mesh poultry netting 36″ wide |
| 1 pc. 1″x3″—14′ | 8′—¼″x3½″ Square head machine bolts with washers and wing nuts |
| 1 pc. 2″x2″—10′ | 2—¼″x8′1½″ iron rods, 4 washers, 2 common and 2 wing nuts each |
| | 2 lbs. 8d cement box nails |
| | 2 lbs. ¾″ wire staples |

N.B.—If used in connection with brooder house one extra iron rod ¼″x8′1½″ should be used in lieu of end panel.

When not in use this run can be stored away in a very small space, or when necessary, moved from place to place with a minimum of transportation space. If runs are not provided, great difficulty is experienced in controlling the poults from the various brooder houses, the tendency being for some houses to be overcrowded while others have but few occupants. There is a particular tendency for the poults to flock in the direction from which the feeder comes and to remain in that vicinity rather than to spread out or distribute themselves among the various houses.

## BROODER EQUIPMENT

The following equipment will be found advisable in brooding poults:

Brooder thermometer
Room thermometer
Hover ring
Water or milk founts
Feed troughs
Grit and shell hoppers
Green feed racks

For descriptions and illustrations of feeding equipment, see pages 32–34.

*Brooder Thermometer.*—A good brooder thermometer, checked against a clinical thermometer for accuracy, is advisable no matter how experienced the operator. The bulb of the thermometer should be placed 2 inches above the floor level. The position of the thermometer is dependent on the type of brooder used.

*Room Thermometer.*—A room thermometer placed on the wall of the room one foot above the floor will serve to indicate to the operator the difference between brooder and room temperature, which with some types of brooders will be very considerable, especially when cold weather prevails. It is undesirable to maintain a high room temperature.

*Hover Ring.*—A band should be secured 1 foot in height and of sufficient length to encircle the brooder at a distance of 6 inches to 18 inches or even more from the edge according to the kind of brooder and temperature at which it is operated. The ring should be far enough from the edge of the hover to allow the poults to seek the temperature best suited to them. The hover ring should be large enough to allow for expansion. This can be inexpensively made of wire netting covered with burlap or of heavy roofing paper with wood strips tacked to it. The purposes of this ring are to keep the poults fairly close to the brooder for the first few days so that they will learn where to go for heat, and to prevent floor drafts. After the second or third day it is usually taken away during the day time. Some growers use it at night for several weeks to prevent the poults from getting too far away from the brooder during the night. As the poults get older it should be kept farther and farther from the edge of the canopy.

*Litters.*—In brooding of turkeys various litters may be used, to facilitate cleaning, form an insulation against cold floors, and improve sanitation. Clean, dry sand, or fine gravel, rice hulls, grain straw, planer shavings, etc., may be used. Any indigestable material that the poult might eat should be avoided during the first 2 weeks. During this period it is usually desirable to use clean, dry, coarse sand or fine gravel as litter, for the poult will not usually use enough of this to do any harm. Musty or moldy litter should be avoided at all times.

Hardware cloth tacked to squares made of 1 x 3 inch or similar material on edge (fig. 20, page 41) is being laid over the floors in many permanent brooder houses and in brooder yards. The mesh of the hardware cloth should be small enough so that the poults' feet will not go through, and large enough so that droppings and dirt will fall through to the floor. Litter is not used with this type of floor. The hardware-cloth squares and the floor should be regularly and thoroughly cleaned with a good disinfectant. The value in the use of hardware cloth is in the improved sanitation, provided it and the floors are kept clean.

## BROODER OPERATION

The temperature at which the turkey brooder should be run will depend upon the type of brooder used, the position of the thermometer, and the age of the poults. Of primary importance is the comfort of the poults, and if that is carefully looked after the exact temperature of the brooder is of minor importance. A good rule to follow is to start the temperature at 98° to 100° F if the thermometer is located near the center of the hover or at 90° to 94° F if the thermometer is situated near the outer curtain. If the brooder is of the heat deflector type, that is, without curtain, the temperature may be 85° to 90° F at the outer edge of the heat deflector or canopy, but in all cases see that the poults are comfortable and that they form a ring around the brooder at a reasonable distance from the source of heat. *If given the opportunity* they will usually settle down at the point where the temperature is most comfortable, moving closer to the source of heat when they become cold and further away if the temperature becomes too high. Bright pilot lights or other bright sources of illumination should be masked or eliminated at night to prevent poults from wandering away to drinking vessels, far corners of house, etc., for they may fail to return to the source of heat. A dim attraction light underneath the hover is sometimes used to enable young poults to return to the source of heat.

As the poults grow older the temperature may be gradually reduced. Climatic conditions as well as physical conditions of the poults will largely determine the rapidity with which brooder temperatures are lowered. The heat should be taken away when all the poults are roosting.

For the first day or two and for several nights a ring of roofing or other material one foot high should be placed around the hover and at a short distance therefrom to prevent poults wandering too far from the source of heat and to prevent floor drafts. Overheating or chilling one night may be the cause of the eventual loss of the major portion of the flock, though the immediate loss may be small.

If low hovers are used they should be raised as needed to give the poults sufficient head room; for they grow much more rapidly than chicks and may require more height in the hover before the operator realizes the need. Poults have hanged themselves and have been otherwise injured by neglect of this precaution.

Strict sanitation should be practiced at all times, for poults are very susceptible to diseases engendered by uncleanliness. Yards should be swept or moved frequently to avoid accumulation of filth. Manure should be removed to a distance. No pools or other sources of dampness should be permitted in the runs.

Poults will begin to seek roosting quarters at the age of 3 to 4 weeks and will usually all be roosting at 6 weeks if given the opportunity. In order to accommodate them low roosts not less than 2 inches wide should be placed in the brooder house when the poults are 3 to 4 weeks of age so that the birds may become accustomed to them. After the poults have all learned to perch, the roosts may be raised to a greater height.

Usually 6 to 8 weeks in the brooder house is sufficient for poults under California conditions, but it may be necessary to keep them in longer if inclement weather is encountered at the time when they would normally be turned out into the rearing yards or onto range.

## FEEDING[5]

### PRINCIPLES OF FEEDING

The feeding of turkeys differs but slightly from the feeding of chickens, so that the principles that apply to chickens apply equally well to turkeys. The feed elements, protein, carbohydrates, fats, minerals, vitamins, and water are just as necessary for turkeys as for chickens, and probably the digestibility of the various feeds is about the same, though no direct experimental results have been reported with turkeys. Since but few feeding experiments have been carried out, the nutritive ratio best adapted to their needs has not yet been definitely worked out. Good feeding practice, together with such experimental work as has been done, seem to show that growing turkeys require more protein than is generally considered necessary for growing chickens, that is, the protein concentration of a turkey feed should be higher than a feed for chickens. The grains commonly used for chickens are equally good for turkeys.

Feeding methods are the same whether the poults are brooded naturally or artificially. To feed properly every turkey raiser should understand the principles of feeding. The following is a brief discussion of the various feed elements and their functions.

[5] For a more complete discussion see: Holst, W. F., and W. E. Newlon. Poultry feeding, principles and practice. California Agr. Exp. Sta. Bul. 417:1–50. Revised 1931. See also: "Feeding Breeding Stock," page 12 of this circular.

*Protein.*—A bird's body contains as much protein as all other groups of nutrients together if water is excepted. Protein is the name of a group of very complex organic substances which always contain carbon, hydrogen, oxygen, and nitrogen. Proteins are all composed of simpler building stones, the amino acids. To give the best results as a food a protein must contain all the essential amino acids.

The proteins are used mostly to build the muscles, or flesh, the connective tissue, feathers, and certain other parts of the bird's body. When protein is fed in excess of requirements, the liver has the ability to transform protein into carbohydrates, fats, or both. The kidneys expell protein in the form of uric acid and urea. A diet too high in protein, therefore, puts a dangerous and unnecessary burden on both the liver and the kidneys.

Proteins are found in practically every organic food. The common ration supplements, however, are milk, fish, and meat products, and certain vegetable products such as linseed meal, soybean meal, peanut meal, etc.

*Carbohydrates.*—These organic compounds contain carbon, hydrogen, and oxygen. This group includes starch, sugars, and cellulose. Cellulose is usually called 'fiber' or 'crude fiber', and is wholly indigestible for turkeys.

In the course of digestion the carbohydrates are broken down into the simplest kind of sugars, in which form they are absorbed. Carbohydrates might be called 'energy feeds' because they are oxidized (or burned) in the bird's body to produce heat. Carbohydrates are either used by the bird in a comparatively short time or are stored as fats.

The common grains are the greatest source of carbohydrates.

*Barley* is one of the commonest feeds in California and is very suitable for the feeding of turkeys, particularly after they have reached the age of 4 or 5 weeks. Generally speaking, large amounts of barley should be used in the feeding of turkeys in California because it is a home-grown product and usually cheaper in proportion in its feeding value than any of the other grains.

*Wheat* is an excellent turkey feed and is usually used in quantities provided it is not too expensive. Some years the price of wheat is so high as to be almost prohibitive.

*Oats,* aside from a high fiber content and the fact that the oat kernels are rather sharp for small turkeys, are an excellent feed but usually too expensive in California where oats are but little grown. The hulled white oats are used extensively in baby poult feeding.

Yellow Indian *corn* is one of the best feeds obtainable and is used extensively in poultry feeding. However, yellow corn is sometimes also rather expensive and the amount used may be reduced on that account.

The *grain sorghums,* such as milo, Egyptian corn, and kafir corn, are used extensively in some sections of California because they are cheap enough in those localities. The grain sorghums are excellent feed if they can be obtained at a reasonable price.

TABLE 1

STARCH VALUES OF VARIOUS GRAINS*

| Feed | Comparative starch value | Amount necessary to replace 100 lbs. Indian corn |
|---|---|---|
| | | *lbs.* |
| Indian corn | 100 | 100 |
| Egyptian corn | 98 | 102 |
| Kafir corn | 98 | 102 |
| Milo maize | 97 | 103 |
| Rice (unpolished) | 97 | 103 |
| Wheat | 93 | 107 |
| Rice polish | 90 | 111 |
| Rice bran | 84 | 119 |
| Barley | 82 | 122 |
| Wheat flour mids | 78 | 128 |
| Molasses | 75 | 133 |
| Oats | 75 | 133 |
| Rice, mill run | 63 | 159 |
| Wheat bran | 57 | 175 |
| Potatoes (fresh) | 24 | 417 |

* Prepared by W. F. Holst, Division of Poultry Husbandry, 1928.

Cracked *rice* or hulled rice is also an excellent feed for the baby poults if used in small quantities. Rice is a very starchy feed and if used in large amounts, it unbalances the poults' ration.

Table 1 may be used as a guide to determine the values of the various grains.

*Fats.*—The fats are very similar to carbohydrates in chemical composition, being composed of carbon, hydrogen, and oxygen. Oxygen, however, is contained in smaller proportions than in carbohydrates. Body fat may come from two different sources: fats in the food eaten, or carbohydrates which have been transformed into body fat. Under certain conditions these body fats may be transformed back into carbohydrates.

Body fat might be termed 'reserve energy'. It may come from any of the foods eaten, but its most common source is the common

grains. Fats in the food are digested with difficulty and are absorbed slowly, so in order to put body fat on an animal, carbohydrates are fed in excess.

*Vitamins.*—Certain of these substances are absolutely necessary for the proper growth and life of birds. Lack of them for any length of time will result in disease and eventually death. On the other hand, birds suffering from vitamin deficiency may be restored to health if the vitamin or vitamins deficient in the ration are again added to it.

Vitamins are all more or less unstable compounds so care must always be taken to have an adequate supply of the essential vitamins in the poultry ration.

The main effect of *vitamin A* is the promotion of growth in young stock. Animals fed on an otherwise perfect ration but lacking in this vitamin stop growing. In addition, if this vitamin is lacking, the secretory glands of the eye, mouth, nose, and throat dry up, and infections often develop in these parts. This condition is often called nutritional roup and can be cured by giving feeds that are good sources of this vitamin.

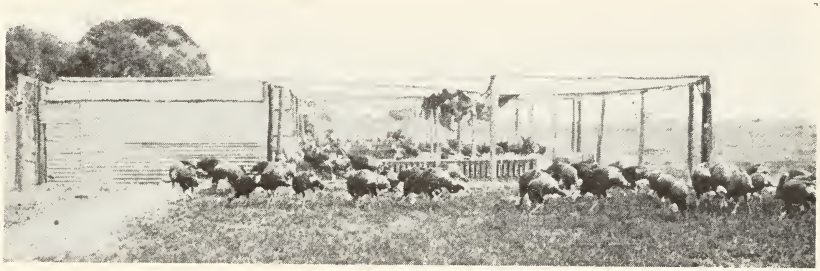


Fig. 13.—Small alfalfa ranges provide greens (vitamin A) and exercise. Note the inexpensive roosting quarters, suitable for dry climates.

Sources of this vitamin are fresh greens (fig. 13), dried green plants, good cod-liver oil, milk fat, and egg yolk fat. It is found to a less extent in the embryos of many seeds.

*Vitamin B* prevents nervous disorders. It is the most widely distributed of all vitamins, being found in the germ and bran of all grains, and in fresh vegetables, green feed, milk, egg yolk, and yeast.

*Vitamin C* is of little importance in poultry feeding, because fowls seem to be able to build it up in sufficient quantities in the liver.

*Vitamin D* promotes proper bone development. A lack of it causes a bone disease called rickets. No matter how much bone-building material is in the ration the bird cannot make proper use of it unless

this vitamin is provided. This vitamin may be supplied indirectly by sunlight. The sunlight should not pass through ordinary window glass, for the glass filters out the rays (ultra-violet) which takes the place of vitamin D. Other sources of vitamin D are certain animal fats, the outstanding of which are cod-liver oil and sardine oil.

*Vitamin E* is closely connected with the functions of reproduction. It is found in many plants and in the embryos of seeds. As far as is known there is little danger of fowls suffering from a lack of this vitamin.

*Green Feeds.*—Succulent, tender greens in some form should be supplied in abundance to young poults. Lettuce, tender green barley, tender alfalfa tips, Swiss chard, and tender green onion tops are all used. Alfalfa meal may be used if fresh greens are not available.

*Minerals.*—Birds need a constant supply of minerals in order to form new bones, other mineral-containing tissue, and, in the case of laying birds, egg shell. Crooked breast bones and improperly formed bones elsewhere in the body are usually caused by a mineral (calcium and phosphorus) deficiency often coupled with a lack of vitamin D—not, as many suppose, by roosting too early. Birds can stand starvation with regard to organic nutrients, which are commonly considered to be most important, longer than they can stand mineral starvation. Calcium, phosphorus, and sodium chloride should be added to the mash of all poultry rations. Other minerals are needed by birds, but only in small quantities. These other minerals ordinarily are supplied in sufficient quantities in the grains and other food in the ration. Common sources of calcium are limestone and oyster shells. Limestone or oyster shells should be finely ground when put in mash and should be coarsely cracked when fed in boxes in the yard. The most common sources of phosphorus are steamed bone meal and spent bone black. Sodium chloride is common salt and is fed to the extent of ½ to 1 per cent in the mash.

*Water.*—Water as a nutrient is essential to the body. Water should be provided continuously, clean, fresh, and at a temperature suited to the bird's needs. Very cold water should be avoided.

## FEEDING EQUIPMENT

*Water or Milk Founts.*—At least two 1-gallon glazed earthenware water founts should be secured for each hundred poults. Glazing makes the founts much more sanitary. Notched outlets permit free flow of milk and work satisfactorily for water. (See figure 14.)

*Feed Troughs.*—All sorts of feed containers have been used for the feeding of poults. It is immaterial what kind is used provided they conform to good principles of sanitation and construction. They should reduce soiling of the feed to a minimum, make feed easily

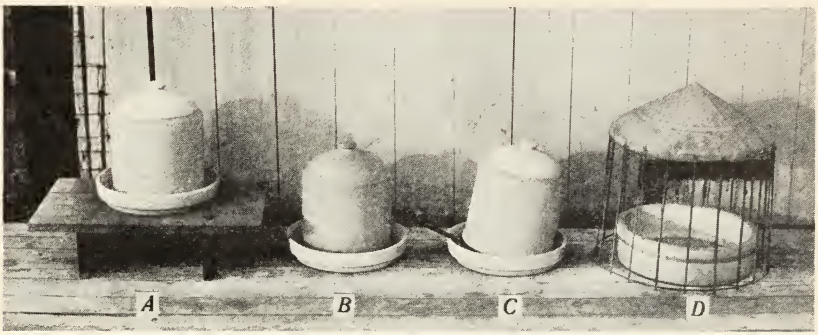



Fig. 14.—*A*, Fountain placed on stand to prevent fouling after poults are large enough to jump up onto the stand.

*B*, One-gallon stoneware drinking fountain with notched outlet.

*C*, Small stick wedged under side opposite notch to facilitate feeding of clabbered milk.

*D*, Drinking vessel protected by wire guard to prevent fouling.

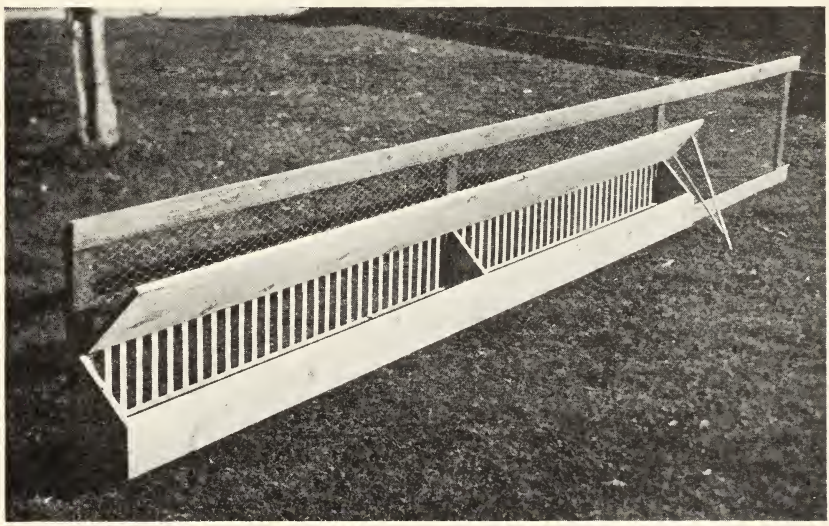
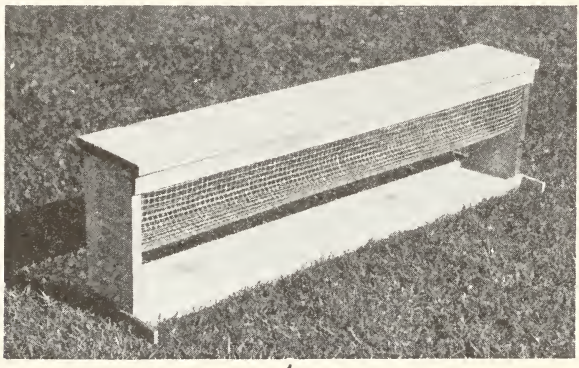


Fig. 15.—A feeder panel such as that illustrated greatly facilitates feeding, being accessible from the outside of the pen.

accessible to the poults, provide plenty of feeding space, and be so constructed as to be adjustable for different-aged poults. See figure 15. Various other types of feeders are shown in figures 4, 5, 17, 18, and 19.

*Grit and Shell Hoppers.*—It is often desirable to have grit, shell, and bone meal in hoppers so that the poults may have ready access to them. Hoppers should be so constructed as to prevent poults from getting in with their feet and soiling the material.



*A*

*B*

Fig. 16.—*A*, Green-feed hopper for small poults. The hopper is made of ½-inch mesh hardware cloth. The whole hopper is raised on suitable blocks as poults grow.

*B*, Good green-feed hopper for mature turkeys. One-inch mesh poultry netting is used in making this hopper.

*Green Feed Racks.*—These can be made out of half-inch mesh hardware cloth with a tray underneath to prevent wastage. The rack may be elevated as the poults grow by putting blocks under the ends. See figure 16, and also figure 8 (page 19).

## FEEDING BABY TURKEYS

Before the poults are put under the brooder have food and water ready. It has been definitely proved that early feeding does not cause unabsorbed yolk. Poults can be fed as soon as they will start to eat. They should not be held longer than 72 hours without feed. No matter

what their age, as soon as they are put under the brooder give them food and water. In feeding the young birds the quality of the feed must be the first consideration. After the birds get older the price must also be taken into consideration. If the turkeys get a palatable mixture containing all of the feed elements in the right proportion and not containing any harmful materials, they will be receiving a good feed. In grains and mill products, there is not enough protein for a complete ration. To supplement the grain, add fish scrap, meat scrap, milk, or a combination of these, in order to raise the protein content.

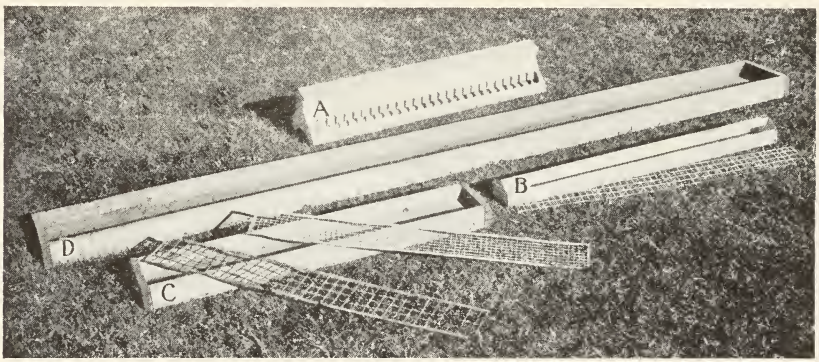



Fig. 17.—Types of feeding equipment used for small turkeys:

*A,* Very good metal feeder for very small poults, designed to keep feed clean.

*B,* Another feeder for use of small poults; the grid prevents wasting of feed and the reel on top prevents roosting and consequent fouling.

*C,* Feeder with more feeding space than *A* and *B;* waste of feed is prevented by a wire grid.

*D,* After two weeks the poults may be fed in larger open troughs.

The younger the animal, the more protein it requires in proportion to carbohydrates and fats, since the younger the poult the more rapidly it doubles its weight.

Turkeys are much slower to begin to eat than chickens and even after they have learned to eat, they seldom exhibit the ravenous desire for feed that chickens do except when very palatable feed is offered them. On account of this apparent indifference to feed in the beginning, it is an old and good practice to start poults on hard-boiled eggs. This is not necessary, but when eggs are available as infertiles discarded at hatching time, they might as well be used. The eggs should be boiled 20 minutes, ground up shell and all, and fed at the rate of 1 chicken egg to 25 poults or 1 turkey egg to 40 poults each meal. Eggs should not be continued for more than 2 days, that is, six meals, or if continued longer the amount of egg given should be

reduced. Such feed as is to be continued after the ground egg has been omitted may be sprinkled over the ground eggs so as to accustom the poults to the new feed. This may be grain or mash according to the method of feeding employed.

All feeding should be done in clean troughs located on clean ground. One 8-foot trough should be provided for each 100 poults. This gives 16 feet of feeding space.

In starting young turkeys, a number of different methods may be used. Some methods which have long been used with success are as follows:

1. Cottage cheese, mash or rolled oats, and finely chopped greens for the first few days, slowly changed to baby chick mash with some cracked grains.

2. Hard-boiled eggs and green feed (onions, kale, or alfalfa) ground together. Feed three times a day all they will clean up in 1 hour. After 2 or 3 days begin working in some starting mash. At 2 weeks have the poults changed to all starting mash.

The newer and more satisfactory practice, from a labor standpoint, is to start the baby turkeys on a starting mash. This should be fed dry from the first, if possible, and should be kept in front of them all the time. At times some difficulty is encountered in getting the poults to begin eating the dry mash. Some growers scatter finely chopped greens over the mash in the shallow troughs. Still others add milk or water to the finely chopped greens and mash until the mash is crumbly. In this latter case, however, the poults should be fed four times a day and the crumbly mash should be cleaned up soon after feeding because there may be danger of its souring. They should be gradually worked over to dry mash by the time they are from 1 to 2 weeks of age.

For those who wish to mix their own starting mash, the following is recommended:

*Starting Mash*

| | | |
|---|---|---|
| 69½ | per cent | coarsely ground grains (corn, barley, wheat, kafir, milo, etc.) |
| 8 | per cent | dried milk |
| 12 | per cent | fish scrap |
| 5 | per cent | alfalfa leaf meal |
| 3 | per cent | sterilized bone meal |
| 2 | per cent | ground shell or limestone |
| ½ | per cent | fine salt |
| 100 | per cent | |

This ration contains all of the food elements and minerals necessary for the poult up to 6 weeks of age, except one-half of 1 per cent cod-liver oil, which should be added if there are more than 3 or 4 days of cloudy weather. Keep this starting mash in front of the poults at all times.

It may be advisable to add feed to the feed troughs several times a day, for the poults seem to relish the fresh feed.

The above mash is designed to be fed without liquid milk. If liquid milk is to be fed in large quantities do not put any dry milk in the starting mash.

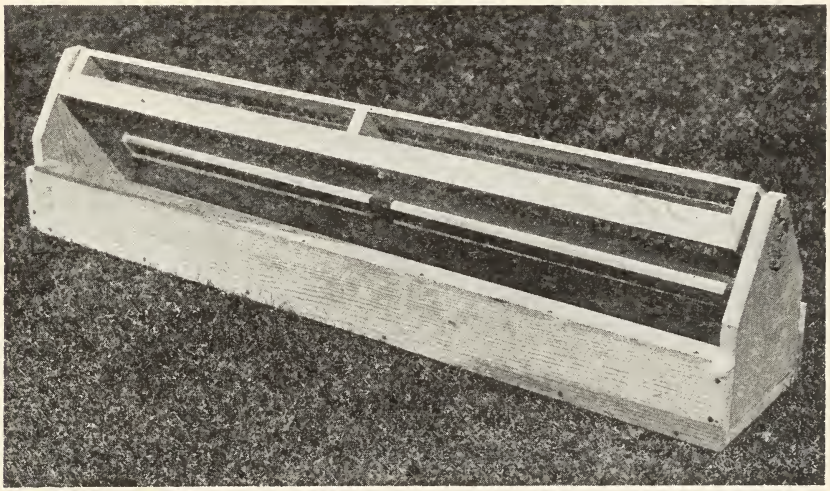


Fig. 18.—Reel poult mash hopper for poults 3 weeks to 8 weeks of age. May be raised on blocks for older poults.

At about 2 weeks of age, it is desirable to start feeding cracked grain. The poults should be changed from cracked to whole grains as soon as they are able to handle them. The small grains (wheat, milo, kafir, water grass seed, etc.) may be fed whole earlier than the larger grains (corn, barley, etc.). Water grass seed should not be fed to poults under 3 weeks of age. The quantity of grain may be gradually increased until at 16 weeks of age they are getting about half grain and half mash. The grains fed should be of good quality and those that are ordinarily cheapest in the locality.

With any method of feeding, the poults should have green feed from the start. Any tender greens are satisfactory. Onion tops are no better than any other form of green feed. The greens should be finely chopped to prevent 'balling' in the crop.

### FEEDING GROWING TURKEYS

At about 6 weeks of age or later the poults should be gradually changed to a cheaper ration. For those who wish to mix their own mash the following formula is suggested.

*Growing Mash*

| | | |
|---|---|---|
| 74½ | per cent | coarsely ground grains; cheap grain of good quality; may be one or a combination of grains |
| 15 | per cent | fish meal (60 per cent protein) |
| 5 | per cent | alfalfa meal |
| 3 | per cent | sterilized bone meal |
| 2 | per cent | ground shell or limestone |
| ½ | per cent | salt |
| 100 | per cent | |

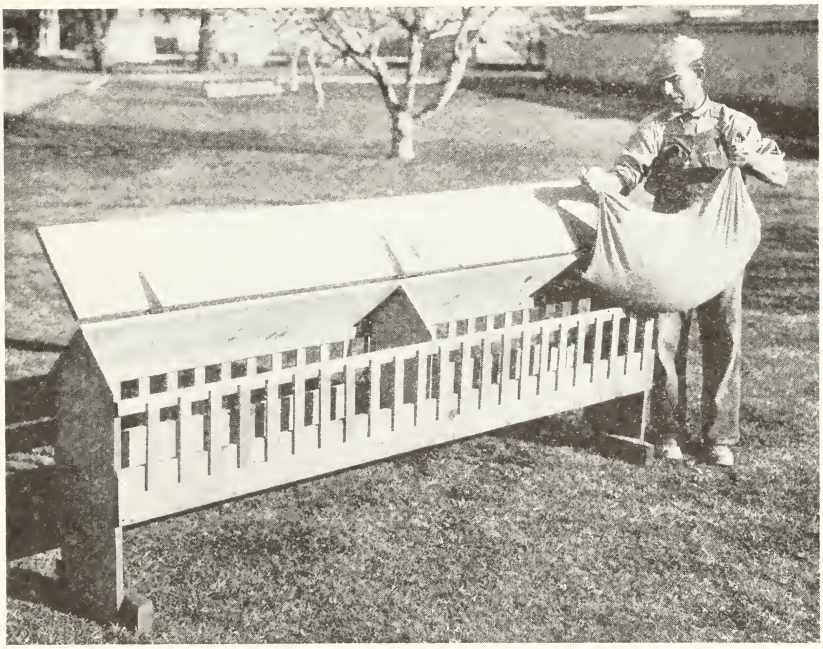


Fig. 19.—Large feeders fairly high off the ground keep the feed clean and free from dampness; suitable for turkeys 5 months of age and older.

If greens or alfalfa hay are not being fed, the alfalfa meal in the above ration may be increased to 10 per cent and the grain decreased to 69½ per cent.

This ration should be fed until the turkeys are marketed. It should be in front of the birds at all times. The change from the previously suggested mash should be gradual.

The quantity of grain should be increased gradually until at 4 months of age the birds should be getting a full feed of grain at night. At this time many growers keep grain in front of the birds all the time. If this is done it should be in hoppers. The birds may not eat much at first but the consumption will soon increase.

## RANGE FEEDING

*Changing from Hand Feeding to Range Feeding.*—Before changing turkeys from hand feeding to range, it is very desirable that they be fed on the feed which they are likely to pick up on the range. If they are to be transferred to a barley range, they should be fed barley for some little time before they are turned out on range. The same is true of rice stubble. It is well also at this time to feed coarse feed, such as alfalfa meal and bran, before the birds are put on stubble, so that the bird's digestive tract may become accustomed to coarse feeds.

*Grasshopper Range.*—In northern California it is a common practice to make use of range. The early range is the 'grasshopper range'. Here the birds have a large amount of protein in the form of grasshoppers but may be short on carbohydrates, greens, and minerals. The commercial turkey raiser should under these conditions feed the birds all the grain they wish to eat along with some alfalfa meal, shell, bone meal and salt. For those who wish to mix feed to supplement the grasshopper range the following is suggested:

| | |
|---|---|
| 80 per cent | grains—the cheapest good quality available |
| 12 per cent | alfalfa meal |
| 4 per cent | sterilized bone meal |
| 3 per cent | ground shell or limestone |
| 1 per cent | salt |

*Stubble Range.*—Later in the season grain or rice stubble is available. Under these conditions the birds usually have insufficient greens, proteins, and minerals. To supplement such a range, fish scrap, alfalfa meal, and minerals should be fed. The following combination is suggested:

| | |
|---|---|
| 30 per cent | alfalfa meal |
| 51 per cent | fish scrap |
| 10 per cent | sterilized bone meal |
| 8 per cent | ground shell or limestone |
| 1 per cent | salt |

This stubble supplement should be fed at the rate of 6 to 8 pounds a day for each 100 poults from the time the poults weigh 5

or 6 pounds to fattening time. For those who grow their own grain, the supplement described above may be fed with the grain, giving the birds all the grain they can eat.

*Feeding Milk.*—If skimmed milk or buttermilk is available it may be fed. If all the mash is to be replaced with milk the birds should have 3 to 5 gallons a day for each 100 poults at 8 to 12 weeks of age and 8 gallons a day from 12 weeks on. The birds should receive all the grain they wish to eat in addition to the milk. If the birds receive less than this prescribed amount of milk they should be fed a proportionate amount of mash. On a food-value basis 5 quarts of liquid skim milk or liquid buttermilk is equal to 1 pound of dried skim milk or about ½ pound of fish scrap.

*Water Supply.*—Fresh, clean, cool water should be available at all times. The ground around water troughs or fountains must be kept dry. This may be done by hauling in sand, or building a slat platform around the water supply. Stagnant water is one of the most fertile sources of digestive disorders in turkeys.

## MANAGEMENT OF GROWING TURKEYS

Three distinct methods of rearing and management are used in California: intensive rearing, where large numbers of birds are grown in confinement or on very limited range; general farm rearing, where as many as 500 may be hatched and turned out on a fenced farm to shift for themselves; and range rearing, where the birds are herded in large bands over a considerable territory. Each of these systems or methods of management requires different feeding and management methods and it is manifestly impossible in this publication to cover all methods and contingencies.

### EQUIPMENT AND ARRANGEMENT

*Roosts.*—Low roosts about 2 feet off the ground (fig. 21) should be provided for the young birds. The perches should be of 2 x 4 inch material with the 4-inch side up. This provides ample resting surface for the bird's body. These need never be raised, for high roosts are a potential source of injury for birds of all ages and are not a protection from marauders. Many crippled backs, broken wings, and lame legs may be attributed to birds' getting up and down from high roosts. If trouble is experienced from predatory animals, better protection is the solution rather than high roosts. Protection can be afforded by wire-covered roosting areas (fig. 4, p. 12), turkey dogs, lanterns posted around the roosting area, night guards, etc.

*Shade.*—While turkeys will stand more exposure to heat than chickens, nevertheless some shade is absolutely essential. If no natural shade is available, artificial shade must be provided, particularly during the hot season.

*Water Supply.*—Open sloughs, stagnant pools, drainage from rice fields, especially late in the season, and water heavily impregnated

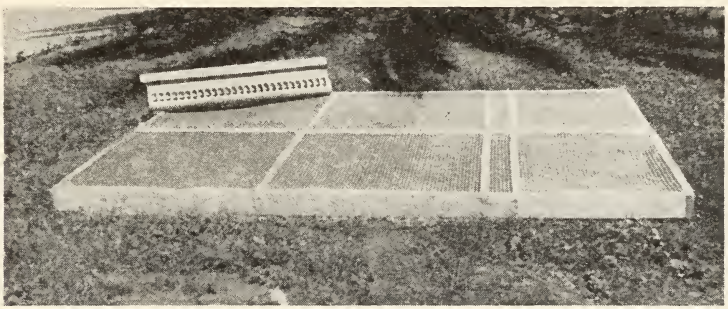


Fig. 20.—Hardware-cloth squares can be easily moved and cleaned and are sanitary.

Fig. 21.—Wire-enclosed open-air roosting shed protects the birds from predatory animals. A turkey dog can be seen lying against the catching crate. Roosts are here placed with the wrong side of the 2 x 4 inch boards up.

with alkali are frequent causes of heavy losses in turkey flocks that are allowed to drink from these sources. All such sources should be fenced off, drained, or the birds removed from the vicinity.

*Losses Due to Carelessness.*—Frequently carelessness in placing unused pieces of equipment in positions that are insecure or are exposed to wind, etc. results in this equipment falling and killing or injuring poults or even larger birds. In windy sections equipment should be anchored or so constructed that it will not blow down, fall, or roll.

## SEGREGATION

*Segregation of Turkeys and Other Fowls.*—Chickens should never be run with flocks of turkeys. Turkeys should be kept off the ground which has been occupied by chickens. There are a number of diseases and parasites which can be transmitted from chickens to turkeys, both through contact and from contaminated soil.

*Isolation of New Stock.*—Any stock brought from another turkey ranch should be kept isolated for at least 2 weeks. This should be made an inflexible rule regardless of where the turkeys are secured.

*Separation According to Development.*—During the hottest of the summer young turkeys generally slow down in their development. There are always some in each brood that do not grow as rapidly as the others. These should be put back with poults their own size or kept separated from the rest of the flock. A little extra attention will often times bring out these backward birds. If left in the flock the larger birds drive them away from the feed and so they never develop properly. In order to increase feed consumption and thereby decrease differences in development many growers feed mash dampened with water or milk twice a day to the slow-developing birds. In the hottest summer months some growers find it desirable to feed dampened mash to the entire flock to stimulate feed consumption and thereby maintain a more even rate of growth.

## HANDLING TURKEYS ON RANGE

*Moving to Range.*—When the poults are taken from the brooder house to open yards or to range they will refuse to roost for at least 1 night and perhaps for 2 or 3 nights. It is therefore necessary that a comparatively small number be put on range at one time to prevent them piling up and injuring themselves. Especially is this true if the nights are cold or windy. If they refuse to roost it will be necessary each evening to see that the poults hover down in very small bunches. The attendant must stay and work constantly with them to accomplish this.

*Stampeding.*—Turkey raisers frequently suffer heavy losses from 'stampedes.' Cats, coyotes, owls, and other marauders may scare the birds while on the roosts, causing most of them to fly and scatter all over the surrounding territory. Such panics usually occur on moonlight nights. Frequently broken wings, broken legs, and bruised bodies are suffered. The birds are also rendered exceedingly nervous and susceptible to further fright. Constant vigilance is the only remedy.

*Herding.*—A good turkey dog (fig. 21) is valuable with range flocks. Such a dog will often save the work of two or three men in herding turkeys and may be of value in keeping away coyotes. Sheep dogs can often be trained to make good turkey-herding dogs if training is started when they are young. A turkey dog must not be rough or vicious with the flock. It is often found desirable to use comparatively small dogs in herding turkeys because very large dogs are sometimes clumsy.

Fig. 22.—A flock of breeders selected before any birds are sent to market will insure that the best stock is kept.

*Changing Location.*—When birds are moved from one locality to another, especially when they are moved from highland areas to lowland areas, care should be taken that the birds are sufficiently hardened to withstand this change. Unless the birds are sufficiently protected by hardening or extra shelter from the changed climatic conditions, severe losses often occur.

*Confining Range Birds.*—Turkeys that are used to unlimited range do not take kindly to confinement and will lose weight until they get used to small pens. If it is necessary to confine closely birds used to unlimited range, they should be confined 6 to 8 weeks before they are to be marketed.

Breeders should be selected before the market turkeys are put in the fattening pen (fig. 22).

## PREPARATION FOR MARKET

### FATTENING TURKEYS

Before a turkey is ready to fatten it should have practically completed the growth of its frame and should have covered this frame with a thick covering of flesh. It is impossible to fatten a bird which is not properly matured. In a large flock it is desirable to separate the matured birds from the growing birds 1 or 2 months before marketing. The matured birds can be put on a fattening ration and the others left on the growing ration.

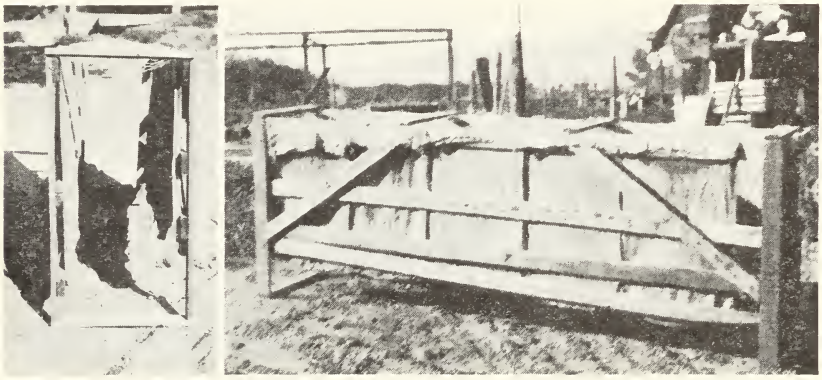


Fig. 23.—Side and end views of movable catching crate. By grasping the legs with one hand and placing the other underneath the breast of the birds they may be caught with a minimum of injury and trouble.

To fatten the birds, increase the quantity of grain consumed. The birds should be used to eating at least one or more whole grains by this time. If it has not already been done grain should be hopper fed and be in front of the birds all of the time. For the last 3 weeks before marketing it is desirable to give two feeds of grain soaked in water or skim milk to increase consumption. This should be fed in hoppers. Never feed more than the birds will clean up in an hour. For those who do not desire to feed whole grains the growing mash may be changed to a fattening mash by the addition of 20 per cent of a ground grain, such as yellow Indian corn, milo, barley, etc.

It should be clearly understood that market turkeys have not attained their full growth, hence require a growing rather than a fattening ration. If they are given a ration that is too wide, that is, one containing too much fat-building material, they will not respond to the feeding as expected.

## KILLING AND DRESSING

*Condition.*—The bird should be full-fleshed, fully covered with fat, free from temporary blemishes, such as torn skin or bruised flesh, practically free from pin feathers, and free from disease.

*Starving.*—All feed should be taken away from the birds 18 to 24 hours before slaughtering. Free access to water may be allowed.

*Killing.*—The bird should be suspended on a shackle having hooks 8 to 12 inches apart. The feet of the turkey should be slipped through the hooks. A strong light cord with a small block on the end, suspended from a rafter is often used. The cord is wrapped around both legs, the block keeping it from slipping.

The cutting edge of the killing knife should be straight to the end. The back of the blade of the knife should curve to the point. The blade should be ⅜ inch wide and 3 to 3½ inches long and strongly built so that it will not break when twisted.

The turkey's mouth should be held open, the back of the head lying in the palm of the left hand. The knife is passed into the turkey's mouth and a cut is made across the throat in a diagonal direction from left to right just back of the angle of the jaw. This will sever a large vein on each side of the throat. This operation must be done properly for the turkey to bleed freely.

As soon as the veins are severed, the knife is thrust through the mouth in a line just below the eye, to the rear lobe of the brain. When the rear lobe of the brain is reached there is a sudden convulsion of the bird's body and a spread of the tail feathers. The rear lobe of the brain must be pierced or the bird will not pick easily.

A 4-pound weight or a blood cup, made of a long slim can weighted with 4 pounds of lead or concrete with a hooked wire soldered to the side, should be hooked in the lower jaw.

*Picking.*—The wing should be firmly held in the left hand and the long wing feathers pulled out with the right. The body feathers should be carefully picked, care being taken not to tear the skin. Pickers should not try to 'slip' or rub the feathers off because this will often 'burn' the skin. As many pin feathers should be gotten out as possible. The ten short fan feathers on the wing tip may be left, otherwise the bird should be entirely free of feathers.

The birds should be hung by the feet to cool overnight. There should be sufficient space between birds to allow a free circulation of air. One carcass should not be allowed to touch another while warm. After cooling the back of the bird's head should be struck

against a padded board to jar out the clot of blood usually found in the throat. A damp cloth is used to wipe any blood off the bird. Feces should be expelled by pushing in behind the vent and between the pin bones. The vent, shanks, and feet should then be washed.

*Head Wrap.*—Some people slip a small paper sack over the head of the bird, holding the sack in place with an elastic. The better and more attractive way is to use a regular head wrap made of brown butchers' or white parchment paper. Head wraps for hens should be 9 inches wide, 18 inches long on one side, and 9 inches long on the other. Tom head wraps should be 10 inches wide, 20 inches long on one side, and 10 inches long on the other. The short edge of the head wrap is placed against and parallel with the neck of the bird and held in place with the left hand. The point of the wrap is taken in the right hand and the paper is wrapped tightly around the neck of the bird. The paper is allowed to flare at the bottom to make a cone. When the wrapping is done the point of the head wrap is at the bottom or large end of the cone. The edge of the cone where the pointed end of the head wrap ends is folded in and pushed up on the opposite side of the head. The other edges of the cone are folded into the same place to form a neat wrap without the use of twine or elastic. The wrap should be tight enough so a 12-pound bird can be lifted and swung by the wrap. The steps in adjusting this wrap are shown in figure 24.

## MARKETING

Practically all of the California Thanksgiving and Christmas turkeys are consumed in this state, and it is usually necessary to ship in turkeys from Nevada, Oregon, and occasionally Idaho or Texas, in order to keep these markets supplied. This is particularly true at Thanksgiving time. Under the warm summer conditions of the interior valleys turkeys do not put on flesh nor fatten rapidly and very few are ready for the Thanksgiving market, except those which are hatched very early and the old hens. About 15 per cent of the birds in the interior valleys are marketed in November and many of these are old hens. Approximately 25 per cent of the birds in the interior valleys are marketed in December and the rest, (60 per cent) are marketed in January and February. The birds marketed in January and February usually go into cold storage to be used during the summer months.

Cooperative turkey-marketing associations are being established in most of the turkey-growing areas of western United States. These cooperatives are aiding in orderly marketing, in securing greater

returns to the growers, and in establishing better quality in the birds marketed. As these associations are helping to maintain a higher price level and are fostering a greater consumption of turkey meat throughout the year, they should receive the support of all turkey growers.

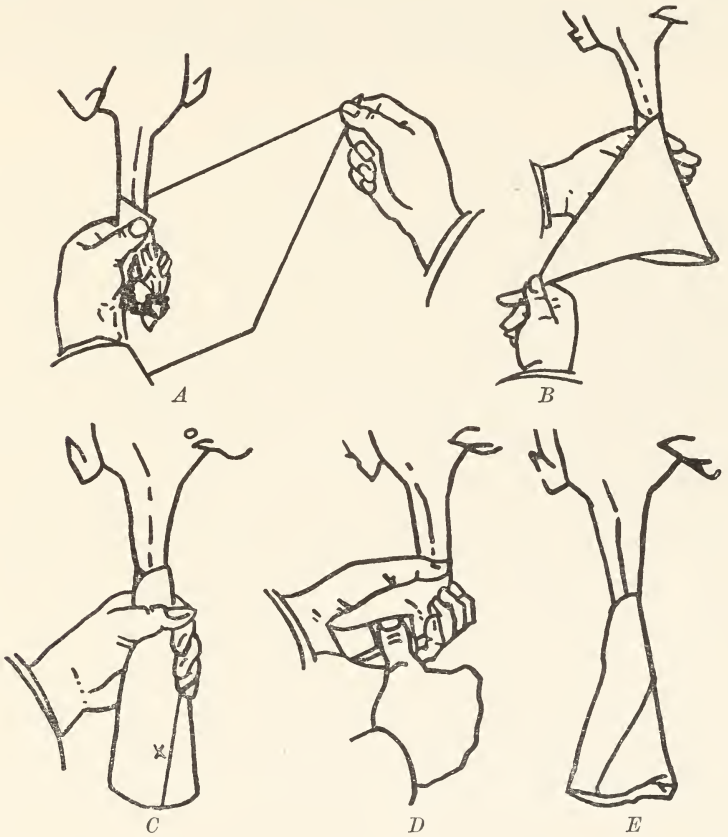



Fig. 24.—Directions for poultry head wrapping (as recommended by Carl L. Alsberg, United States Department of Agriculture, Bureau of Chemistry.)

*A*, Getting started: Hang the bird by the feet in a shackle or rope loop. Hold the head firmly, bill to the front. Slant the paper as shown, being sure that the longer edge is uppermost. There must be plenty of thumbhold on the pointed end over the neck.

*B*, Pull tight: Pull the upper long edge downward and to the left. Be sure the edge of the paper at the neck is tight. Notice how it dents the flesh a little.

*C*, Changing hands to get bell shape: As the left hand swings the paper around, the right loosens its hold and the left hand catches neck and paper firmly. This makes a 'bell' with even overlapping edges at the bottom, and the edge *X* almost a vertical line from the grasping fingers downward.

*D*, Close the bell: Holding with the left hand, turn the head so that you can see inside the 'bell'. With the thumb and just a little assistance from the fingers, push the edge of the 'bell' up and in.

*E*, Neat and clean: This is the finished head wrap. Holding the bird by the legs you can 'snap' it hard, but the head wrap will not come off.

Government grades are growing in importance throughout the United States. These grades are of great benefit to the growers because the grading will be identical throughout the country. Buyers can order on United States Government grades and be sure of getting the quality they specify. Prime and choice are ordinarily sold in California as Number 1, Medium as Number 2, and Common as Number 3. The 1930 specification for the government grades are as follows:

UNITED STATES GRADES

*U. S. Prime or No. A 1 Grade.*—Young, fine-grained, soft-meated birds with broad, full breast, and with back, hips, and pin bones fully covered with fat. Must be well bled, well dressed, and practically free from pin feathers, with crops empty. No flesh bruises allowed, and only very slight skin abrasions, bruises, or discolorations permitted, none of which shall be on the breast. Slightly dented breast bones (not to exceed ¼ inch in depth) permitted, but no crooked breasts or other deformities allowed. A broken wing above the wing tip, or a broken leg not permitted; must be dry picked or semiscalded, and dry packed.

*U. S. Choice or No. 1 Grade.*—Young, soft-meated birds, with well-fleshed breast, and with back, hips and pin bones well covered with fat. Must be well bled, well dressed, and may show some few scattered pin feathers other than on the breast, with crops empty. Only slight flesh or skin bruises, abrasions, or discolorations permitted, none of which shall be on the breast. Slightly dented breast bones (not to exceed ½ inch) permitted but no crooked breasts that would interfere with the slicing of meat, or other deformities allowed. One broken wing in the flesh or one broken leg below the flesh permitted if break is clean and without bruise or blood clot and if bone does not protrude through the flesh. Birds with crops properly removed and sewn, if otherwise suitable, may be included in this grade.

*U. S. Medium or No. 2 Grade.*—Young, soft-meated birds, with fairly well-fleshed breasts, and with back, hips, and pin bones fairly well covered with fat. Must be fairly well bled and dressed and may show some scattered pin feathers over the entire carcass. Crops must not contain over 4 ounces of feed. Slight flesh or skin bruises, abrasions, or discolorations permitted, but not more than three such defects to each bird unless very small. Abrasions or tears over 3 inches in diameter not allowed, except on the back or wings, unless properly sewn. Dented or slightly crooked breast bones or other slight deformities permitted. Broken wings or broken legs permitted, but not more than one to each bird if showing blue or green from bruising.

*U. S. Common or No. 3 Grade.*—Young birds which may be poorly fleshed, with back, hips and pin bones poorly covered with fat. May show evidence of poor bleeding and contain numerous pin feathers over the entire carcass. Crops may contain not over 8 ounces of feed. Flesh or skin bruises, tears, abrasions or discolorations permitted, but not such as to make any appreciable amount of the carcass inedible. Dented or crooked breast bones or other deformities allowed. Broken wings or legs permitted. Badly emaciated birds not allowed.

## COST OF PRODUCING TURKEYS

In tables 2 and 3 are some preliminary cost of production figures gathered by the Agricultural Extension Service of the respective counties in cooperation with turkey growers in the county. It should be borne in mind that in any one year feed costs, mortality, selling price, and other factors may be high or low; that costs and selling price vary in different sections of the state; and that management of production and marketing vary widely from ranch to ranch. And since cost accounts have been kept in but a few counties and with but a few cooperators in each county, the cost account figures are preliminary and tentative; they may not accurately represent general conditions even in the counties for which they are available.

## DISEASES OF TURKEYS[6]

The turkeys should be kept free from disease and parasitism by intelligent appreciation of the importance of sanitation and feeding. The grower should know the different turkey diseases and parasites and strive continually to prevent conditions favorable to outbreaks. It requires an alert operator to keep a flock free from diseases. The continuous feeding of internal medicines is highly undesirable. Clean ground, clean water, clean feed, clean houses, and clean breeding stock, coupled with sunlight, fresh air, and disinfection, are the best means of maintaining a healthy flock. Birds brought to the turkey ranch from other flocks should be kept in isolation for at least 2 weeks. They should be treated for external and internal parasites. Diseases of turkeys are practically identical with those of chickens; therefore, for a complete discussion of diseases, the turkey grower should refer to the circular mentioned in the footnote.

[6] For a more complete discussion of disease and parasites see: Beach, J. R., and S. B. Freeborn. Diseases and parasites of poultry in California. California Agr. Ext. Cir. 8:1–73. Revised 1930.

## TABLE 2

### SOME FACTORS IN TURKEY PRODUCTION

| County | Year | Number of flocks | Total breeding hens | Average for all flocks in county | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Birds per breeding flock | | Eggs per hen | Birds raised | | Dressed weight per turkey sold | Investment per turkey raised | Feed | | |
| | | | | Hens | Toms | | Per hen | Per cent of total | | | Per turk raised | Per pound of turkey | Cost per 100 pounds |
| | | | | | | | | | *pounds* | *dollars* | *pounds* | *pounds* | *dollars* |
| Imperial | 1928 | 5 | 105 | 21.0 | 2.4 | 31.0 | 8.0 | —* | — | 1.59 | — | — | — |
| | 1929 | 5 | 84 | 16.4 | 2.2 | 66.5 | 12.9 | — | — | 0.72 | 66.3 | — | 2.17 |
| San Bernardino | 1927 | 4 | 225 | 56.0 | — | 44.0 | 14.0 | — | 11.9 | 4.91 | 70.5 | 5.68 | 2.75 |
| | 1928 | 4 | 144 | 36.0 | 4.5 | 43.0 | 15.0 | — | 12.9 | 3.79 | 66.1 | 5.1 | 2.67 |
| | 1929 | 8 | 406 | 50.8 | 6.0 | 46.6 | 12.0 | — | 13.9 | 2.82 | 84.8 | 6.1 | 2.90 |
| | 1930 | 7 | 95 | 95.0† | 18.0† | 30.0 | 12.9 | — | 13.5 | 2.34 | 90.7 | 7.1 | 2.38 |
| Tehama | 1928 | 16 | 1,210 | 117.0 | 8.5 | 22.0 | 8.3 | 58.7 | 11.5 | 0.96 | 62.5 | 5.4 | 2.06 |
| | 1929 | 12 | 1,413 | 118.0 | 8.8 | 19.6 | 7.6 | 70.1 | 13.1 | 1.08 | 99.0 | 7.3 | 1.94 |
| | 1930 | 14 | 1,996 | 142.6 | 11.4 | 19.8 | 8.2 | 69.4 | 13.6 | 1.28 | 48.2 | 6.0 | 1.58 |

* Dashes indicate that data are not available.

The number of breeding hens and toms 1930 record is for one flock only. The other six enterprises purchased poults and kept no breeding stock.

TABLE 3

COSTS AND PROFITS PER POUND IN PRODUCING TURKEYS

| County | Year | Number of flocks | Number of hens breeding | Cost | | | | | | | | | Gross income | Profits* | Farm income† |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Feed | Range, pasturage and hay | Family labor | Hired labor | Eggs, poul·s, and breeding stock | Misc. | Interest, depreciation, and overhead | Decrease in stock inventory | Total cost | | | |
| | | | | *cents* | *cents* | *cents* | *cents* | *cents* | *cents* | *cents* | *cents* | *cents* | *cents* | *cents* | *cents* |
| San Bernardino | 1927 | 4 | 225 | 18.1 | 0.0 | —‡ | 8.0‡ | — | —¶ | — | 0 | 35.1 | 55.0 | 19.9 | 25.1 |
| | 1928 | 4 | 144 | 16.7 | 1.9 | 3.5 | 3.0 | 2.6 | 1.0 | 2.7 | 0 | 29.5 | 40.9 | 11.4 | 16.7 |
| | 1929 | 8 | 406 | 19.3 | 0.0 | 2.2 | 3.4 | 2.7 | 1.0 | 2.0 | 0 | 31.4 | 38.2 | 6.8 | 10.2 |
| | 1930 | 7 | 95 | 18.2 | 0.0 | —‡ | 6.1‡ | 0.3 | — | — | — | 34.7 | 35.5 | 0.8 | 4.3 |
| Tehama | 1928 | 16 | 1,010 | 10.9 | 3.3 | 9.0 | 1.0 | 0.3 | 0.5 | 0.7 | 1.3 | 27.1 | 33.3 | 6.2 | 15.0 |
| | 1929 | 12 | 1,413 | 13.2 | 2.9 | 5.5 | 3.6 | 0.1 | 1.2 | 0.8 | 0.0 | 27.3 | 31.8 | 4.5 | 10.5 |
| | 1930 | 14 | 1,996 | 9.4 | 1.7 | 4.3 | 2.9 | 0.7 | 1.4 | 1.0 | 0.2 | 21.6 | 29.6 | 8.0 | 12.9 |

* "Profits" are the actual profits to the turkey raiser after deducting his own labor, interest on his investment, depreciation, and other such factors.

† "Farm income" is used to denote what many farmers call "profit." The farmer's own labor and interest are not deducted.

‡ Allowance for family labor included with cost of hired labor.

¶ Dashes indicate that data are not available.

DISINFECTANTS FOR HOUSES, EQUIPMENT, AND YARDS

*Carbolic Acid (Phenol).*—This disinfectant is used in a 5 per cent solution of water as a spray. It is usually too expensive for general use.

*Compound Solution of Cresol.*—This is used in a 3 per cent solution of water as a spray. It is a very good disinfectant, and the cost is reasonable.

*Disinfectants with a Phenol Coefficient Stated on the Label.*—Good disinfectants with a high phenol coefficient can be obtained on the market at a reasonable price, especially in lots of 5 gallons or more. These are sold under various trade names. The phenol coefficient indicates the strength of the material as compared with pure carbolic acid. The higher the phenol coefficient the greater the germ-killing power in the same dilution. Products with a phenol coefficient of 10 should be diluted at the rate of 2 parts of the product to 98 parts of water for ordinary brooder-house disinfection. Products with a lower phenol coefficient should be diluted to make a solution of approximately the same strength as the above. In other words, a product with a phenol coefficient of 5 should be diluted at the rate of 4 parts of the product to 96 parts of water. The phenol coefficient will be found on the container of the product.

*Crude Carbolic Acid.*—Crude carbolic acid is not desirable to use unless the percentage of cresylic acid or tar acid is known, and even then its value is questionable. Enough water should be added to make a 2 per cent solution of the tar acid. The solution should be thoroughly agitated as it is used. Oil lowers the disinfecting value of any disinfectant and should not be used as a substitute for water in making dilutions.

*Bichloride of Mercury.*—Bichloride of mercury is used in a 1: 1,000 solution. It is a dangerous poison, and should never be used on metals. It is usually not desirable to use around turkeys.

*Hot Lye Solution.*—One pound household lye in 40 gallons of water is useful in cleaning houses. One pound of lye to 8 or 10 gallons of water is a good disinfectant as well as a cleanser. This should not be allowed to touch the skin of the operator.

*Disinfectant Whitewash.*—Whitewash, if used, should follow thorough cleaning. It is often used on interior of houses to lighten dark interiors, but should not be used in new houses. The following formula is recommended:

| | |
|---|---|
| Water-slacked lime | 3 gallons |
| Salt | 2 pounds |
| Commercial lime and sulfur dip | 4 gallons |
| Water | 40 gallons |

### DISINFECTANTS FOR USE ON BIRDS

*Tincture of Iodine.*—Iodine may be used for any external wounds, and for treatment of eye or mouth. It is effective and reasonably priced.

*Argyrol.*—A 10 to 15 per cent solution of argyrol may be used in eyes, mouth, or nasal cavity. It is very good but somewhat more expensive than iodine.

*Potassium Permanganate.*—This disinfectant is often used to kill organic matter in water that may be contaminated. A sufficient amount is added to turn water deep pink. As soon as the color changes from deep pink to brown, mix fresh supply, for it has lost its strength.

### BLACKHEAD

Blackhead is caused by a microscopic organism. Inflammation in the cecum presumably opens the way for the blackhead parasite to enter the turkey. Turkeys become infected when they run on soil contaminated with the blackhead organisms and the cecum-worm eggs.

*Symptoms.*—The head of the bird affected with blackhead seldom turns black, but in a certain proportion of the cases takes on a somewhat bluish color.

There is no way a definite diagnosis can be made except by autopsy. External symptoms are droopiness and droppings stained a sulfur color.

When a bird has blackhead the main changes in the organs are confined to the ceca, or the blind pouches of the intestines, and the liver. The walls of the ceca become thickened in spots or may be generally thickened. There may be a cheesy core. The ceca are usually enlarged. The liver is permeated with dark-red, grayish, or yellowish spots.

*Prevention and Control.*—Birds should be reared on ground free from cecum-worm eggs. Soil which has been under cultivation and has not been occupied by birds for a year is regarded as safe.

Use of large areas tend to prevent soil contamination. Damp ground is conducive to long life of the cecum worm eggs and blackhead organisms.

Treatment of the flock to prevent infestation with cecum worms may assist in preventing blackhead. There is no treatment that can be relied on to keep the birds free from cecum worms but continuous feeding of 2 per cent tobacco dust in the dry mash may be of considerable value.

A great number of drugs and substances have been recommended by investigators and laymen for the prevention and cure of blackhead. None of these have been proved to be of value.

The diseased birds should be isolated. Proper feeding, giving them sour milk if possible, may be of benefit.

The flock should immediately be moved to new clean ground. Treating for cecum worms by including 2 per cent tobacco dust in the dry mash may also assist in preventing the further spread of the disease through the flock.

### FOWL TYPHOID[7]

Fowl typhoid has recently been found in a number of turkey flocks in California. It is possible that this disease has sometimes been mistaken for blackhead. Contact with chickens or the use of yards that have been occupied by chickens is an important factor in the spread of the disease. Flocks grown in confinement are apparently more susceptible to fowl typhoid than those raised on range.

*Symptoms.*—The birds refuse to eat, become listless, and usually show a greenish to yellowish diarrhea. The birds having fowl typhoid show a tendency to separate themselves from the rest of the flock.

The birds usually die in good flesh. The heart is usually swollen and contains small grayish areas. The liver is enlarged from two to three times its normal size. Often the liver is bronze to mahogany-colored or covered with a mixture of bronze and mahogany streaks. The spleen is ordinarily enlarged two or three times its normal size. The lungs are grayish colored.

*Prevention and Treatment.*—Keep turkeys away from chickens or pens used by chickens. When the disease appears, move all the turkeys every few days to clean range if possible, or at least to new yards and quarters, until the disease ceases. Substituting milk for drinking water will nourish the birds that will not eat. A mild laxative (all milk with no other food, or the 40 per cent milk mash used in coccidiosis control, or epsom salts) should be given the day before the birds are changed to a clean yard.

### CHICKEN-POX

*Symptoms.*—The disease is manifested by small wart-like growths on the skin of the head and neck of the bird, and also by the formation of masses of yellow, cheesy material or canker in the eyes and mouth.

Outbreaks of chicken-pox vary greatly in severity. In many sections of the state the disease comes at market time and prevents the sale of the birds. The mortality from this disease is ordinarily

[7] Hinshaw, W. R. Fowl typhoid of turkeys. Veterinary Medicine 25:514–517. December, 1930.

small in turkeys. However, it slows down rate of growth and egg production.

This disease cannot occur unless the virus of chicken-pox is present, although unsanitary conditions and poor methods of care and housing make it more likely to occur or more severe. Outbreaks are most prevalent during the fall and winter but may occur at any time of the year.

*New-Type Vaccine.*—The disease can be prevented by the use of the new-type chicken-pox vaccine. The authors have seen over 6,000 turkeys vaccinated with this vaccine. None of these vaccinated birds ever had the chicken-pox after vaccination. This was in a locality where chicken-pox was prevalent and had caused considerable difficulty. The birds were between 4 and 5 months of age at time of vaccination. The subcutaneous method was used. One cubic centimeter of new-type chicken-pox vaccine was injected.

The feather-follicle method of vaccination has been found to be very effective in the control of chicken-pox. The vaccine is more easily applied and the cost of vaccination is less. With this method not more than 4 feathers nor less than 2 are plucked from the lower thigh just above the hock. The vaccine is applied with a stiff brush to the exposed feather follicles. This will produce a typical chicken-pox scab on each infected follicle. On this account all birds in the flock should be vaccinated at the same time, else the disease may be contracted by unvaccinated birds. The scabs should disappear and the scar tissue heal over within six weeks.

With any method of vaccination, birds that are to be marketed at Thanksgiving should not be vaccinated with the chicken-pox vaccine later than September 15. For a complete discussion of chicken-pox and methods of vaccination see California Agricultural Extension Circular 8.[8]

*Control of Outbreaks.*—Additional attention should be given to sanitation when chicken-pox appears in the turkey flock. The diseased birds should be separated from the healthy birds and the pens and houses thoroughly cleaned. By keeping the infected birds separated from the well birds it may be possible to keep the disease from spreading. The healthy flock should be inspected daily so that new cases can be found and removed from the flock. Cankers should be removed from the eye and mouth and iodine applied. By keeping the flock in good physical condition many of the troubles often accompanying chicken-pox can be avoided.

[8] Beach, J. R., and S. B. Freeborn. Diseases and parasites of poultry in California. California Agr. Ext. Cir. 8:6–23. 1930 revision.

### SWELLED HEAD, COLDS, AND ROUP

*Symptoms.*—Colds are manifested by a discharge from one or both nostrils. When the discharge collects in the nasal sinuses it causes a marked swelling of the face and is rapidly transformed into a mucilaginous liquid just beneath the eyes. This stage of the disease is called swelled head or roup. If turkeys did not get colds they would not have roup. This disease is usually the result of poor physical condition, weather conditions, or housing, but it is infectious.

*Treatment.*—The most important control measure is to determine and, if possible, remove the causes. Examine housing and feeding and check for intestinal parasites.

For colds, clean nostrils by pressing out the mucus, clean the cleft with absorbent cotton on a stick, and apply a drop of tincture of iodine to each nostril and cleft.

In cases of roup (swelled head), a treatment which has been found to be reasonably effective is as follows: Reduce the swelling by forcing out the mucilaginous material. This should be done as gently as possible to prevent tissue injury. The cleft and nostrils should then be cleaned. Inject with a hypodermic needle, 1 to 2 cubic centimeters of fresh 15 per cent Argyrol solution into each pouch. Great care must be taken to insert the point of the needle only into the open cavity. Before the bird is released, drop a drop of Argyrol into each nostril and into the cleft. In ordinary cases one treatment is sufficient to control. In severe cases a second or possibly a third treatment, 10 days apart, may have to be given.

In cases where the swelling is sufficiently large to warrant opening the swelling, it may be opened with a sharp knife, or a small chunk cut out with a sharp pair of scissors. The opening should be made on the lower side of the swelling. The contents should be gently pressed out and the cavity washed out with a saturated solution of copper sulfate (bluestone). The treatment should be repeated as often as necessary to effect a cure.

### NUTRITIONAL ROUP

*Symptoms.*—A disease affecting chickens and which may perhaps occur in turkeys is caused by a deficiency in vitamin A. The symptoms are weakness, emaciation, a discharge from both nostrils, which may be followed by a swelling beneath the eyes, a discharge which causes the eyelids to stick together, the formation of white round cheesy pustule-like patches in the mouth and throat of about the size of a pinhead, and occasionally the formation of masses of white cheesy material in the cleft or elsewhere in the mouth. The disease may be

distinguished from chicken-pox by the absence of yellow color in the cheesy material, and by the small size of the patches and color of the cheesy material in the mouth. It may be distinguished from colds and roup by the presence of white lesions in the eye and mouth in addition to nasal discharge and swelling of the face.

Post-mortem examination of the birds that have died usually shows the kidneys to be very pale and marked with a network of very fine white lines. Occasionally there is also found a deposit of a white material on the surface of the liver, on the membrane around the heart, or elsewhere on the surface of the organs.

The disease occurs where there is a deficiency of green feed. It will occur if an insufficient amount of green feed is given, or even where the birds have access to greens, if the greens are a distance from the feed troughs or sheds and the birds do not go to pick them.

*Control.*—This disease is easily controlled by feeding the birds sufficient vitamin A. Greens, alfalfa hay, alfalfa leaf and blossom meal, cod-liver oil, and yellow carrots are good sources of vitamin A.

## COCCIDIOSIS

Coccidiosis is one of the most destructive diseases of young turkeys. The causative organism is very widespread. The disease ordinarily appears in turkeys from 2 to 8 weeks of age. It has been known to appear at an earlier age.

*Prevention.*—Every effort should be made to prevent the appearance of the disease. Good physical condition of the poults may prevent its appearance or at least render it less severe. *Strict sanitation* before and during the brooding period is the best preventive. *Clean yards, clean houses,* and *clean feed,* plus good management will ordinarily prevent the appearance of the disease, or if it does appear, modify its severity.

*Symptoms.*—The symptoms are droopiness, loss of appetite, rough feathers, and standing with wings drooping and head *drawn in,* with eyes closed for long periods of time. Blood may appear in the droppings. If it does this a positive proof of the presence of coccidiosis. However, in an increasing number of outbreaks, no blood appears in the droppings, so lack of blood in the droppings is no longer an indication that the birds do not have coccidiosis.

Post-mortem examination may show that the walls of the ceca (blind pouches of the intestine) are thickened. The ceca may be normal in size or markedly distended. They sometimes contain sufficient blood to give them a reddish appearance. Often the ceca are apparently normal. On opening the intestine immediately behind the

gizzard the lining of the intestine may be found to be inflamed. This disease attacks the lining of the intestine, the lining of the ceca, or both. As inflammation of the lining of the intestine may be caused by poisonous material eaten or by improper management, *it is not safe to make a diagnosis without laboratory confirmation.*

*Control.*—Sanitation is the first control measure to be practiced. The litter should be cleaned out of the brooder house every other day (daily is better), the floor swept clean, and new litter put in. The yards should be cleaned at the same time. Every fifth day the house and the yard if possible should be disinfected in addition to the cleaning. The feed hoppers and water founts should also be disinfected. Where the poults are being raised with hens, the 'A' coop should be moved ahead to new ground every other day.

Outbreaks of coccidiosis in poults can usually be promptly controlled by feeding sufficient dry or liquid skim milk or buttermilk and by following the above sanitary program. If sanitation is neglected little benefit from the milk feeding can be expected.

If dry milk is used it should constitute 40 per cent of the mash. The composition of the mash is not of importance so long as it contains 40 per cent dry milk and makes a suitable mixture for feeding to young turkeys. A mixture that has been found satisfactory consists of the following ingredients:

40 lbs. dry skim milk or buttermilk
10 lbs. wheat-bran
30 lbs. yellow cornmeal
20 lbs. ground barley

The feeding of the above mash should be started as soon as the presence of the disease is determined. The mash should be constantly before the poults. Greens should be fed as usual.

Grain should be fed once daily but restricted in the amount to from one-third to one-half the weight of mash consumed. This system of mash and grain feeding is continued as long as there is any indication of the disease. This usually requires from 1 to 2 weeks. The change back to the normal ration should be gradual. If mash alone is fed the 40 per cent milk mash should be given for not more than 6 days, the normal feeding *gradually* resumed.

When liquid milk such as buttermilk or skim-milk is to be used it should be of good quality. The milk should be constantly before the birds in fountains or troughs. If troughs are used covers should be provided that will prevent the chicks from walking in them or roosting over them. The poults are allowed no water. No mash is fed. Grain is fed twice daily, very sparingly in the morning and a larger amount at night. Greens are fed as usual. One-half pint of cod-liver oil is

added to each 100 pounds of grain if the poults cannot go out of doors or if the supply of greens is insufficient. After all evidence of the disease has disappeared, the feeding of mash may be very gradually resumed, water again given, and the amount of milk reduced.

Semi-solid buttermilk, after diluting with two parts of water may be used in the same manner as liquid skim milk or buttermilk.

Warmth and fresh air are essential for the health of the poults and also assist in keeping the houses dry. If possible the well should be separated from the sick, putting the normal poults in new clean quarters. The worst cases should be killed. Dampness in the house or yard keeps the organisms alive; the organisms will not live where it is dry and warm.

### OTHER DISEASES

The following diseases have been found but rarely, if at all, in turkeys in California: pullorum disease (bacillary white diarrhea), infectious bronchitis, fowl cholera, and tuberculosis.

## PARASITES OF TURKEYS

Infestations of worms cause unthrifty appearance and loss of weight. If worms are suspected, several birds should be opened and the intestines examined for their presence. The treatment to be given will then depend on the kind of worms found. Flocks can become heavily infested with worms without the owner suspecting it. In the meantime serious damage has been done to the flock. Every turkey raiser should be on guard to prevent an infestation.

### ROUNDWORMS

*Description and Life History.*—Young turkeys are commonly infested with this worm. These worms vary from 1½ to 3 inches in length. They have a round body, are pointed on both ends, and are yellowish white in color. The mature worm in the intestine deposits eggs which pass out of the body of the bird in the droppings. After a few days' exposure to the air, a young worm develops in the egg, which, if eaten by the bird, promptly hatches and soon becomes a mature worm in the bird's intestine. The worm eggs are very resistant and will persist in the ground in a healthy condition for months.

*Control.*—Control is dependent on two things—elimination of the worms from the bird's body, and strict sanitation to prevent reinfestation.

Two per cent by weight of tobacco dust, with a guaranteed nicotine content of not less than 1.5 per cent nor more than 2.5 per cent, fed in the mash for 3 to 4 weeks, will eliminate the round worms.

Another satisfactory treatment consists of dosing each bird with a nicotine sulfate capsule. These can ordinarily be purchased from feed concerns or drug stores.

Care must be taken to place the capsule well down the bird's throat, and then with the thumb and forefinger the capsule should be located from the outside and slid down to the crop. One capsule is sufficient for small turkeys. Two capsules may be given to mature turkeys, though many growers believe that one is sufficient.

The worms are eliminated with the capsule treatment in approximately 48 hours. Capsuling should be followed by a thorough mechanical cleaning of houses and yards to prevent reinfestation. Chemical sprays are useless for this purpose. All wet spots in the pens or houses should be eliminated.

### CECUM WORMS

These tiny worms measure from ½ to ¾ inch in length and are found in the ceca, or blind pouches, of the intestine. On account of their small size they are often overlooked by the turkey raiser. Many believe that they provide the means by which the organism of blackhead enters the turkey, but it has recently been shown that blackhead can occur without the presence of this worm. Because of the sheltered position of the worm it is very hard to eliminate. The same treatment outlined for roundworms should be followed in treating for this worm. It is believed that the roundworm treatment of tobacco dust is more effective in eliminating this worm than is the capsule treatment.

### TAPEWORMS

*Description and Life History.*—Tapeworms are flat, segmented worms, white in color, which inhabit the intestinal tract. They vary in size from almost microscopic to 10 inches long, according to the species. They have a 'head', or scolex, by which they attach themselves to the wall of the intestine.

The segments drop off and are voided from the body, at which time they appear as glistening white pearly objects. If the tapeworm eggs are picked up by flies, snails, sowbugs, etc., which act as an intermediary host, the young tapeworm develops up to a certain stage in the host's body, and then remains dormant until the host is eaten by turkeys. The larval tapeworm then becomes active, further development takes place, and the worm becomes mature, sloughing off more segments full of mature eggs.

The various flies—housefly, stable fly and others—are known to be the intermediate hosts of several of the more common tapeworms. When manure and other rubbish, in which the fly larvae mature, are promptly and efficiently disposed of, little trouble results from tapeworms. Feeds which attract flies are undesirable.

*Control.*—Dr. Maurice Hall of the United States Department of Agriculture has shown that kamala is an exceedingly efficient treatment. One gram of kamala either as a pill or in a triple-naught (000) capsule should be given. As the kamala is a laxative it is not necessary to follow with purgatives. Many flocks have been treated satisfactorily with this drug, but occasionally severe mortality occurs. It is therefore recommended that the turkey raiser treat a few of the least valuable birds 48 hours before the entire flock is treated.

### SCALY-LEG MITE

This mite burrows beneath the scales on the leg where the irritation and consequent swelling causes the scales to lift. Treatment consists in dipping the legs of the bird in a mixture of equal parts of crude oil and kerosene or old crank-case oil, taking precautions to avoid wetting the legs above the hock.

### COMMON RED MITE

This mite is a small grayish red mite, which hides away during the day in cracks or crevices in the house or roosts, and may live 3 to 5 months without food.

Treatment consists of thoroughly cleaning out the house, removing all boxes, coops, boards, etc., and then thoroughly spraying the house, taking care to get the spray material in the cracks and crevices and on the underneath side of the roosts. The most satisfactory of all applications are the wood preservatives similar to Carbolinium that have the coal-tar product anthrocene oil as a base. A mixture of crank-case oil and kerosene is efficient in killing the mites. The oil used should be very penetrating.

### LICE

*Description.*—Lice can be distinguished from all other parasites on the body by the fact that they have three pairs of legs and their bodies are divided into three sections.

They are seldom over 3/16 inch in length and are of a yellow or grayish color, sometimes ornamented with dark stripes, but never uniformly dark brown or red. The entire life of lice, including the egg stage, is spent on the bird. The eggs require about a week to

hatch. None of the present-day remedies are effective on the egg stage. Therefore a substance must be used which will stay on the body of the bird long enough to kill the emerging young, or the treatment must be repeated between 8 and 14 days after the first treatment.

*Control.*—Sodium fluoride is safe to both birds and operator and eliminates in one treatment all stages of lice. The commercial sodium fluoride which can be bought from feed dealers or drug concerns is satisfactory.

Sodium fluoride may be mixed with three or four times its bulk of flour or talc and applied with a large shaker, ruffling the feathers as the chemical is applied.

Black Leaf 40 (40 per cent nicotine sulfate) painted on the roosts in a narrow stripe just before the birds go to roost will kill body lice. Most effective results are secured if the application of Black Leaf 40 is made on a warm, windless night.

If the night is cold or windy the treatment is not nearly so effective. No observations have yet been made as to whether or not this treatment kills head lice. As this treatment does not kill all the eggs it is necessary to repeat the treatment after 10 days.

## SUMMARY

Artificial incubation and brooding lend themselves to modern sanitation requirements better than natural methods. Large numbers now necessary to make a satisfactory income are most easily handled by artificial methods.

Breeding stock should be one-third pullets and the rest yearlings or older and of the variety and type that best suits market demands. A broad, deep, long-breasted, sturdy, vigorous, quick-maturing bird usually meets both the operator's and market requirements. Breeding stock should be selected before any birds are sold in the fall.

Eggs used for setting should weigh not less than a minimum of 2¾ ounces nor more than a maximum of 3½ ounces for best consistant results. In hatching, adequate ventilation and moisture are the two most important factors.

Artificial brooding of poults is very little different from artificial brooding of chicks. Poults are sensitive to heat and cold. The poults should all be roosting at 6 weeks of age. Feeding of poults differs but slightly from the feeding of chicks. Poults respond readily to relatively high protein feeds, especially when they are young. Lack of mineral, or nonabsorption of it is the cause of crooked breast bones rather than early roosting.

The turkey grower should make every effort to keep the turkeys growing from the time they are hatched until they are marketed. During the summer months it may be necessary to feed dampened mash. Cut green feed or a satisfactory substitute should be fed from the time the poults are hatched out until they are marketed.

Birds on the range should have a supplementary feed. The character of this feed will depend on the kind of range.

Six to 8 weeks before marketing the birds should be segregated according to development. Those that are sufficiently matured should be fed increased amounts of grain; the rest should be continued on the growing ration.

Only properly matured birds should be killed for market. Extreme care must be taken to do a good job of killing and dressing.

Cooperative turkey-marketing associations and government grades are worthy of the support of turkey growers. The superior product being marketed throughout the year is the result of grading and pool marketing.

Clean ground, clean water, clean feed, clean houses, clean breeding stock, plenty of sunlight and fresh air, and frequent disinfection are the best means of maintaining a healthy turkey flock.

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